# THE ARCHITECTURAL FORUM

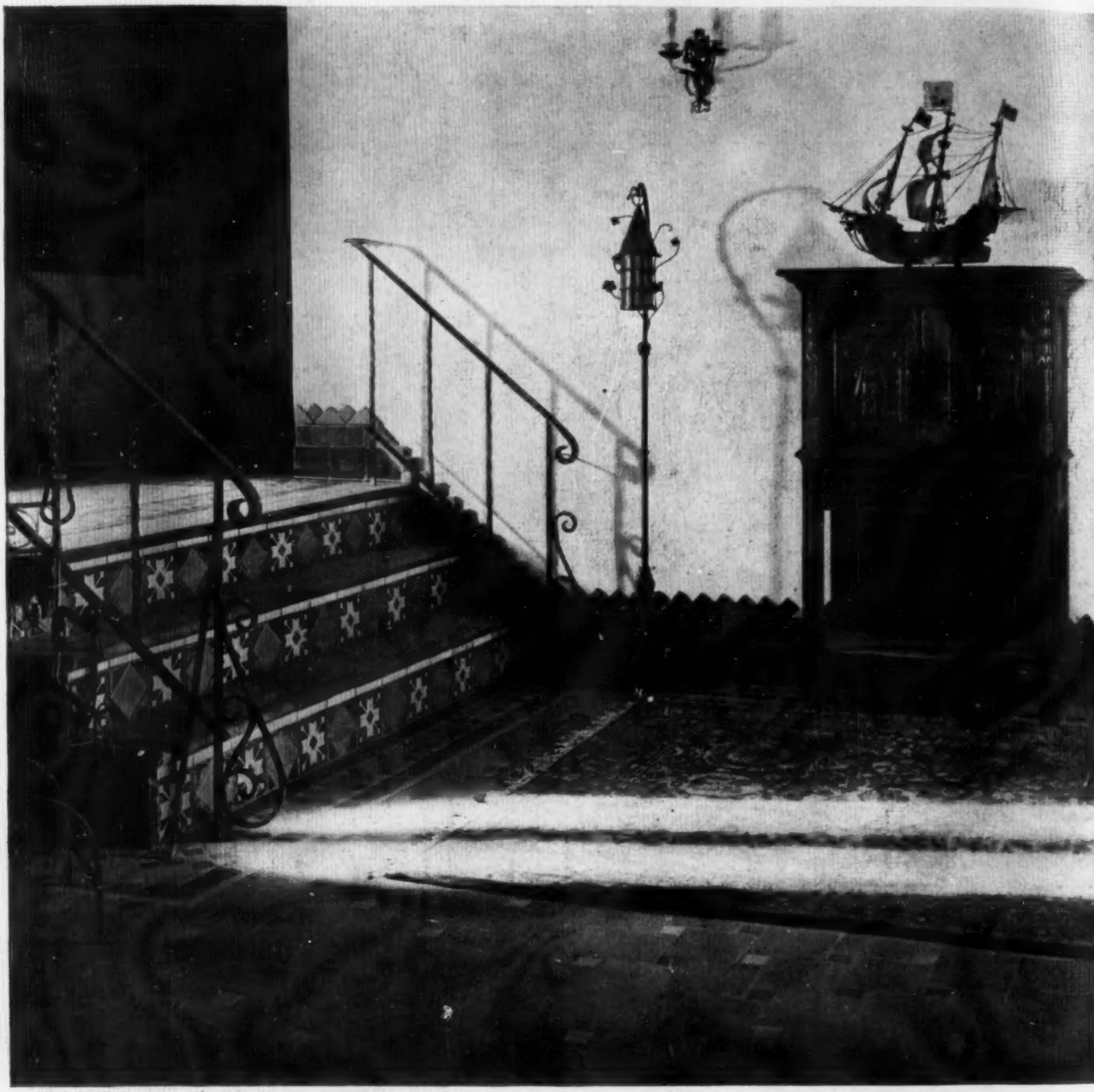
IN TWO PARTS

PART ONE

ARCHITECTURAL DESIGN

MAY

1928



*Entrance hall of the Barcelona Apartments, Forest Hills, N. Y.* *Boris W. Dorfman, Architect*

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## PART ONE—ARCHITECTURAL DESIGN



## PART TWO—ARCHITECTURAL ENGINEERING AND BUSINESS




PARKER MORSE HOOPER, A.I.A., Editor
KENNETH K. STOWELL, A.I.A., Associate Editor
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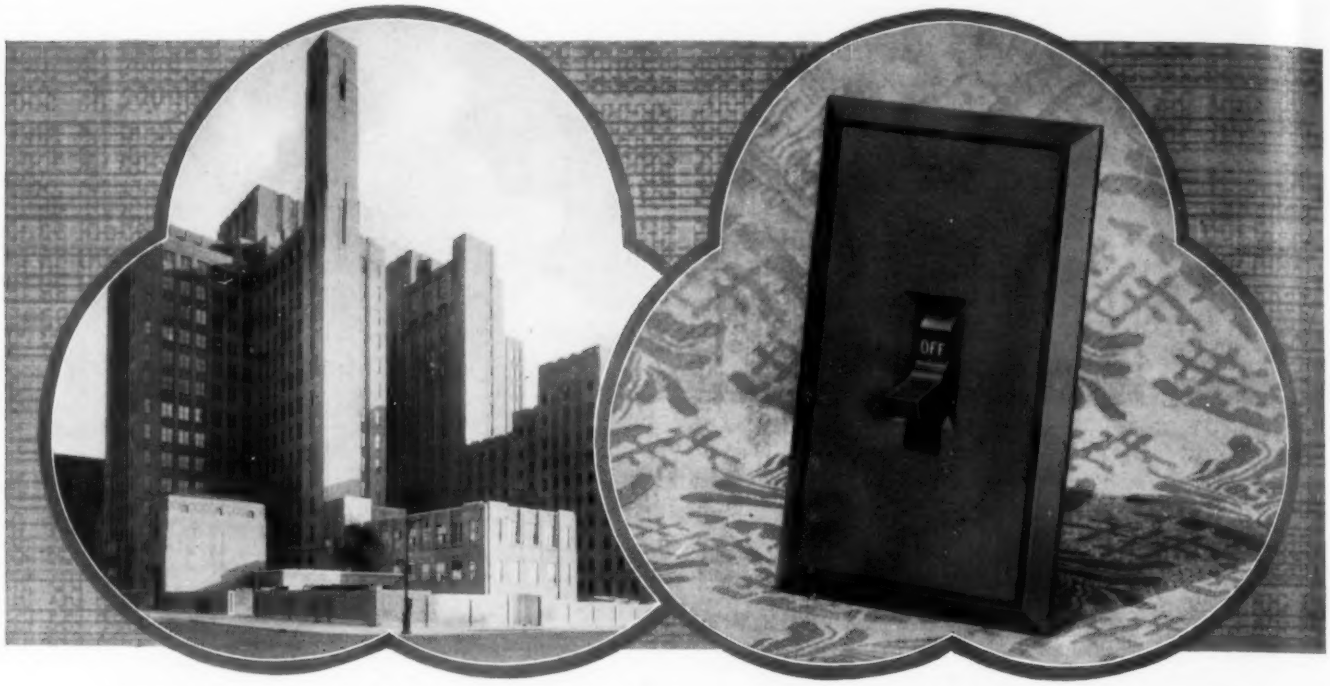



*Medical Center, New York, John Gamble Rogers, Architect. Switches provided with Bakelite Molded Cover Plates.*

# THE EDITOR'S FORUM

## PRESERVATION OF AN OLD TOWN

BELATED efforts are being made to save the few towns in America not ruined by improvement, and to rescue and preserve in towns already spoiled the few good old buildings which still exist. Williamsburg, in Virginia, is about to undergo restoration on a considerable scale, those in charge of the project having acquired possession of almost the entire town and being now about to remove all buildings not in keeping with Williamsburg's pleasant, old fashioned architectural character, restoring the town to as nearly as possible what it was during its palmy days when it was the capital of Virginia. "In Annapolis several old buildings have been acquired by St. John's College and are presently to be restored and saved for posterity, the Brice house, and, among several others, the Hammond-Harwood house, and the Peggy Stewart house, built by the owner of the vessel that caused the Peggy Stewart Tea Party, the Annapolis counterpart of the Boston Tea Party. The Hammond-Harwood house, which will be maintained as a colonial museum, is recognized by architects as one of the finer examples of Georgian building. It is one of the few houses having semi-octagonal wings. There is no explanation for the shape of the wings, but according to tradition, they were added to take the place of an extra story, provided for in the original plan, as a concession to Edward Lloyd, who lived in the Chase mansion across the street and did not want his view of the harbor obstructed by the erection of other buildings.

"Unlike the celebrated Southern Colonial homes built from designs by Christopher Wren, Inigo Jones or Robert Chambers, the Hammond-Harwood house has the distinction of being a product of the native-born architect, Matthew Buckland. He followed patterns then in vogue, and doubtless consulted Swan's 'British Architect' for some of his models, but his own genius is apparent in his vigorous treatment of the designs he used. The lumber is supposed to have been cut on one of the farms of the first owner; the brick to have been made by workmen in Annapolis."

## A TEXTILE COMPETITION

THE ART ALLIANCE of America makes announcement of its 12th annual Textile Design Competition and Exhibition to be held June 6-16, 1928. Prizes are offered for designs of costume fabrics, Jacquard upholstery fabrics, and printed decorative fabrics of silk, linen or cotton, and special prizes are offered by a number of well known manufacturing firms. Information regarding the competition and exhibition may be had of the Secretary of the Art Alliance of America, Mrs. Harriet E. Brewer, 65 East 56th Street, New York, who is in active charge of the arrangements for holding the competition.

## AN INTERNATIONAL CONFERENCE

ANNOUNCEMENT is made of a conference dealing with the subjects of housing and town planning to be held in Paris July 2-8, 1928. Under the direction of Sir Ebenezer Howard, President of the International Federation for Housing and Town Planning, assisted by architects from the United States and almost every country in Europe, there will be discussed various phases of planning towns and regional developments and different aspects of the housing problem. Meetings of the Federation have been held for many years,—in Paris in 1913 and 1922; in London in 1914, 1920 and 1922; in Brussels in 1919; in Gothenburg in 1923; in Amsterdam in 1924; in Vienna in 1926; and in New York in 1925. Data regarding the conference may be had of the Organizing Secretary of the Federation, who may be addressed at 25 Bedford Row, London, W. C.

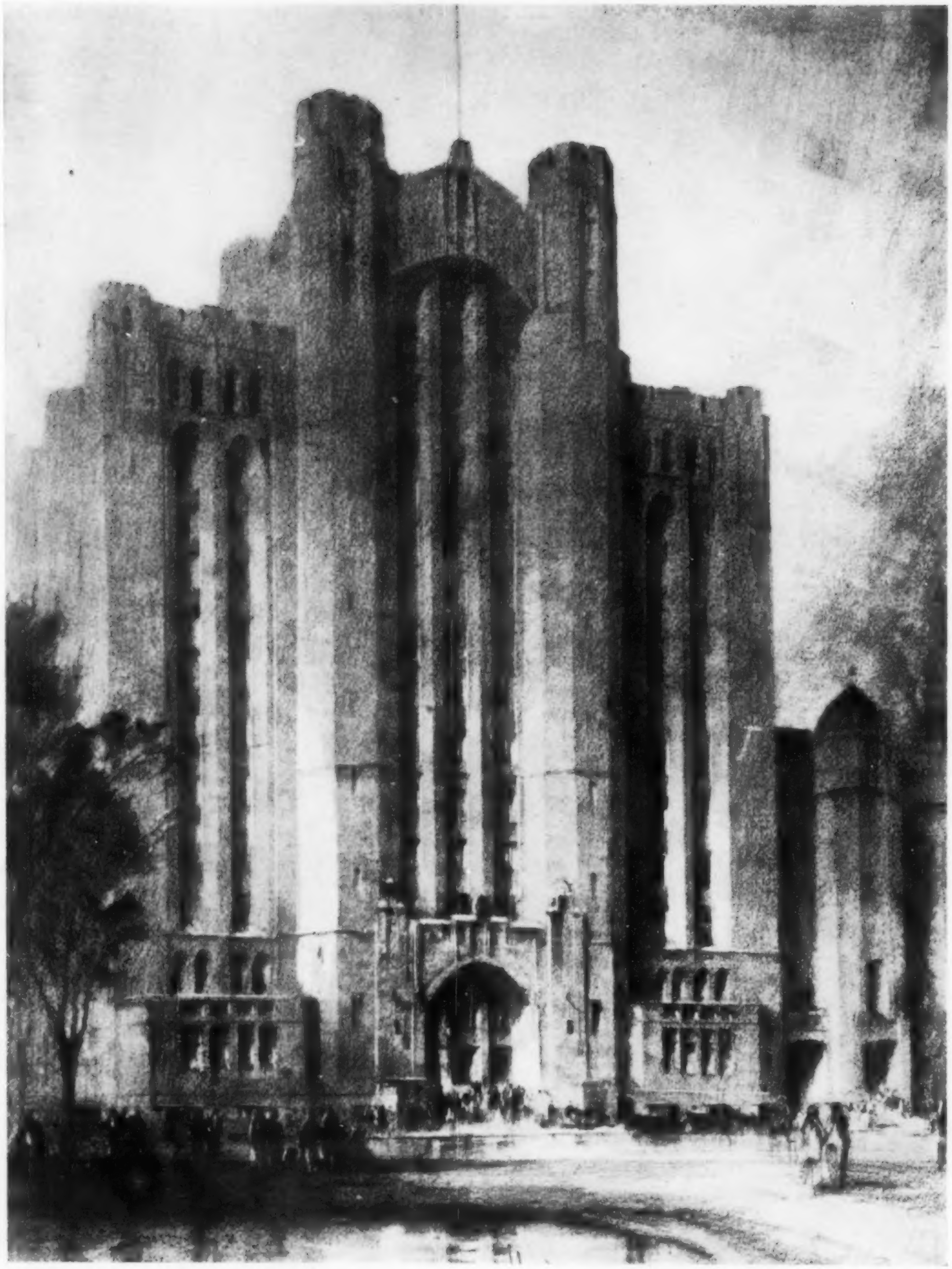
## ERRATA

IN the March, 1928 issue of THE ARCHITECTURAL FORUM several errors were made in crediting the designing of buildings and the preparation of articles. The designing of the Senior High School-Junior College building at Muskegon, Mich., illustrated on page 317, should have been credited to Turner & Thebaud, with William B. Ittner, Inc. as consultants, and the article entitled "The One-Story Schoolhouse," beginning on page 409, was prepared by Ernest Sibley, of Palisades, N. J., and should have been credited to him. Credit for the designing of the Orange High School, illustrated on pages 327, 328 and 411, should have been given to Ernest Sibley, Architect, Lawrence C. Licht and Glenn A. Hacker, Associated; the building was designed by them.

## ENROLLMENT IN ARCHITECTURAL SCHOOLS

EDUCATION in the field of architecture is undergoing unprecedented expansion throughout the country, according to a statement recently made by Professor William A. Boring of the School of Architecture of Columbia University. Public appreciation is increasing, and student enrollment has reached record figures. At Columbia last year, qualified applicants for admission to the School of Architecture were so numerous that the registration was permitted to exceed the number fixed as a proper limit of enrollment in this department in the interests of both faculty and students.

"The University must train architects who fearlessly accept the modern problem, solve it in the modern way, but always conform to those elemental truths which have ever expressed that beauty and good taste which distinguish all true art and which have come down to us as our priceless inheritance."



DETROIT MASONIC TEMPLE

GEORGE D. MASON & CO., ARCHITECTS

From a Litho Pencil Rendering by Hugh Ferriss

THE
ARCHITECTURAL
FORUM

VOLUME XLVIII NUMBER FIVE

MAY 1928

# NAZARETH HALL, ST. PAUL

MAGINNIS & WALSH, ARCHITECTS

BY

MAURICE LAVANOUX

IN its main lines the building of a theological seminary is certainly not a novel problem. Its aim is to provide adequate facilities for the training of candidates for the priesthood. Usually it is located amid quiet surroundings, since such an institution is eminently a place for peaceful and scholarly pursuits, well calculated to train the students for their future mission. If we admit that a well designed fabric allied with judicious planning is as necessary as a suitable location, we shall realize that the buildings here illustrated excellently exemplify this two-fold requirement, beautiful buildings in a beautiful setting.

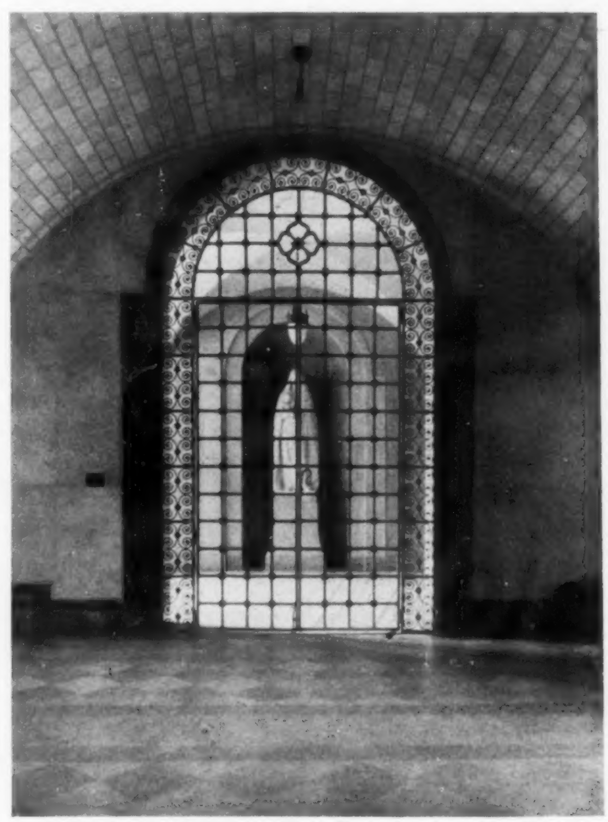
Nazareth Hall, the preparatory seminary for the Archdiocese of St. Paul, is an institution where boys, ranging approximately from 14 to 18 years of age, receive their preliminary training before entering the major diocesan seminary. This period of training consists of a six years' course,—four of high school and two of college work. It must not be supposed that a seminary, and particularly a preparatory seminary, is a place where a boy finds a vocation. It is rather a training ground for those who feel called by God to the priesthood, and who may continue their studies in the major seminary with a consciousness of definite vocation. Nazareth Hall is situated on the shores of Lake Johanna, about seven miles from the center of St. Paul. Its possessing this ideal location is largely due to the foresight of Bishop Cretin, the first incumbent of the see of St. Paul. Bishop Cretin, along with the other pioneer members of the American hierarchy, realized the need of seminaries for the training of a native clergy, attuned to the customs and institutions of the new republic. He secured 40 of the present 90 acres. On the deed to the property Bishop Cretin wrote these words: "This property will, at some time, be used for a diocesan institution." The present seminary is the realization of the bishop's hopes.

The style of this group of buildings might be termed Northern Italian Romanesque. The strong lines of the square tower express the pivotal element of the design, connecting the chapel with the classrooms and living quarters of the faculty and the seminarians. Customarily buildings of this nature follow a traditional expression of plan,—the long central unit with an axial entrance and two flanking pavilions with the chapel behind. The architectural weakness of this plan consists in its relegating the most interesting element of the group to the rear. This location of an important unit as an integral part of the mass detracts from its deserved importance and individuality. It was because of this fact that the picturesqueness of the Lake Johanna site determined the location of the chapel in a more symbolic and central position, so that it would dominate the entire composition. The wisdom of this solution would not be vindicated did it not at the same time permit a logical internal relation of the chapel to the rest of the group, so that it lends itself to easy circulation. Nazareth Chapel, however, is no less correctly situated with reference to the interior life of the college than it is to the external architectural interest of the entire group of buildings. An interesting principle of the plan is the relation of the convent unit to the chapel through a direct approach, and the complete seclusion of the sisters, who have their own chapel, garden and quadrangle. A study of the plan as a whole will explain the relation of the other major elements.

In buildings of such a religious nature, it is well that careful study be given to the design of the altar and the chapel. The altar is truly the soul of the entire conception of it; the thoughts of the seminarians are unceasingly directed to the consciousness of their high prerogative and privilege. The simplicity of the altar in Nazareth Chapel is its chief merit. It is liturgically ideal, and should its design influence the minds of future builders of parishes, it will prove to have been a bulwark raised against further production of those dubious "works of art" that disfigure so many of our churches. The main entrance *motif* strikes an interesting note. The sculptural treatment above the door is based on the thought of Nazareth. The guardians of the doorway are the Blessed Virgin and St. Joseph. In the tympanum is a figure of the Boy Christ with arms outstretched. Above the caps are the symbols of the evangelists. A distinguished note of decorative interest is found in a tympanum

THE CHAPEL AND NORTH SIDE OF DORMITORY

THE LIBRARY FIREPLACE

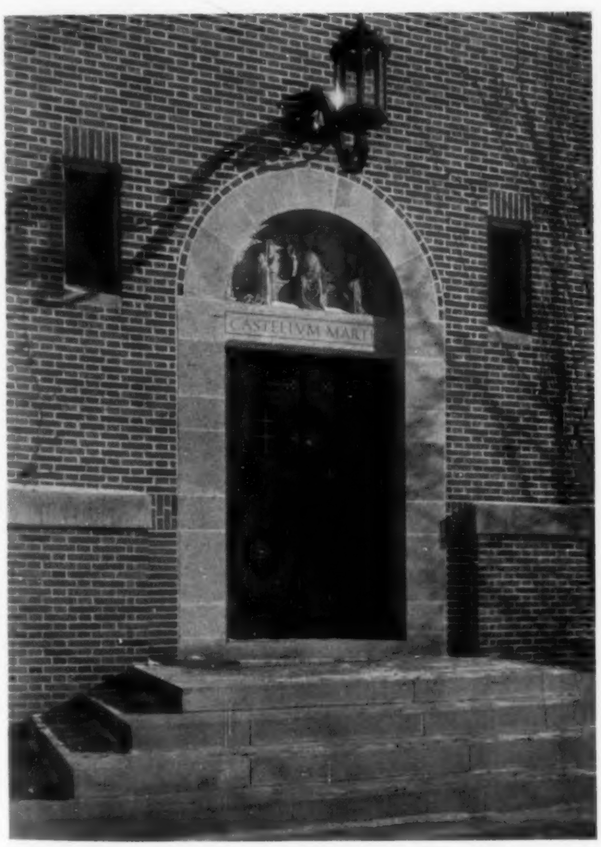


GRILLE IN ENTRANCE LOBBY

NAZARETH HALL, ST. PAUL

MAGINNIS & WALSH, ARCHITECTS

DORMITORY WING AND CENTRAL TOWER

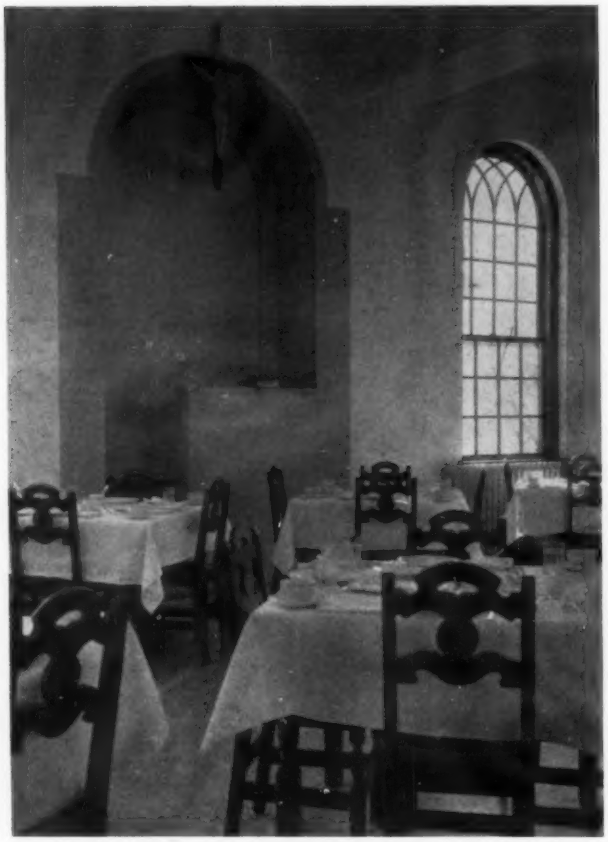


ENTRANCE TO THE CHAPEL

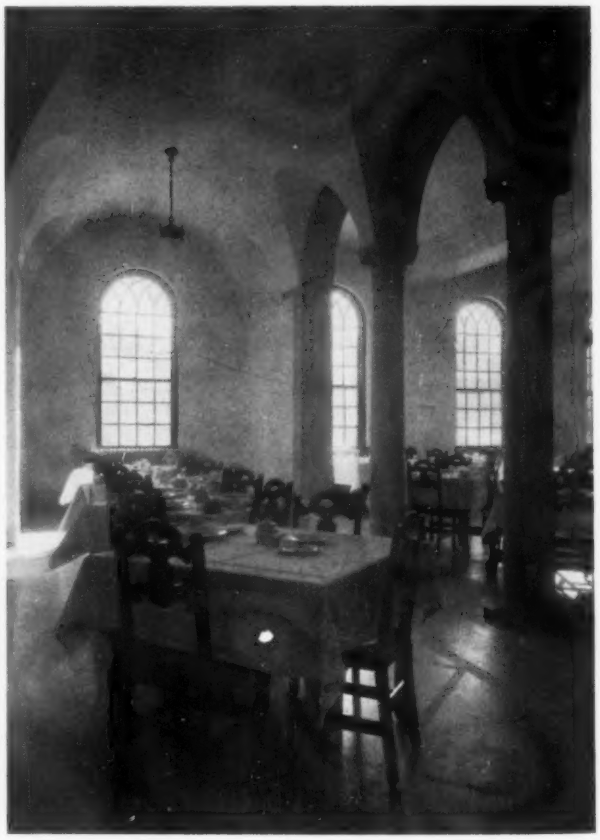
ONE END OF THE LOGGIA

NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS

WEST DORMITORY WING FROM THE MAIN COURT



READER'S DESK IN THE REFECTORY



ENTRANCE LOBBY TO THE REFECTORY

NAZARETH HALL, ST. PAUL

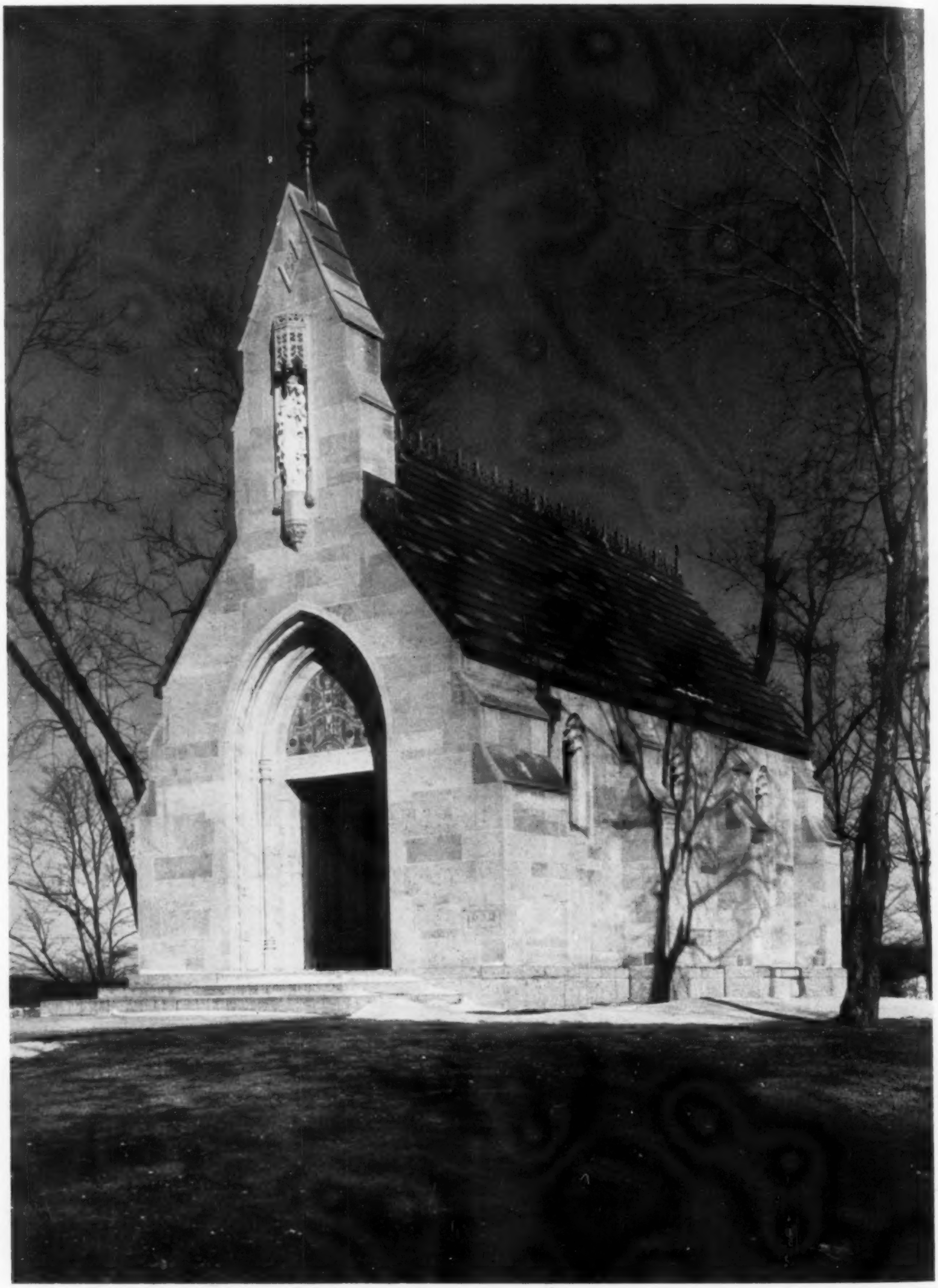
MAGINNIS & WALSH, ARCHITECTS

THE ADORATION OF THE PEASANTS, BY FRANK H. SCHWARZ, IN THE LITTLE GOTHIC CHAPEL ON THE ISLAND

THE BOY CHRIST, BY SIDNEY WOOLETT


MOSAIC PANEL, BY CHARLES J. CONNICK, ABOVE ENTRANCE TO THE LITTLE CHAPEL

THE VIRGIN AND CHILD, BY A. H. ATKINS



THE LITTLE GOTHIC CHAPEL ON THE ISLAND
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS

THE GREAT TOWER AND CHAPEL FROM THE EAST
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS

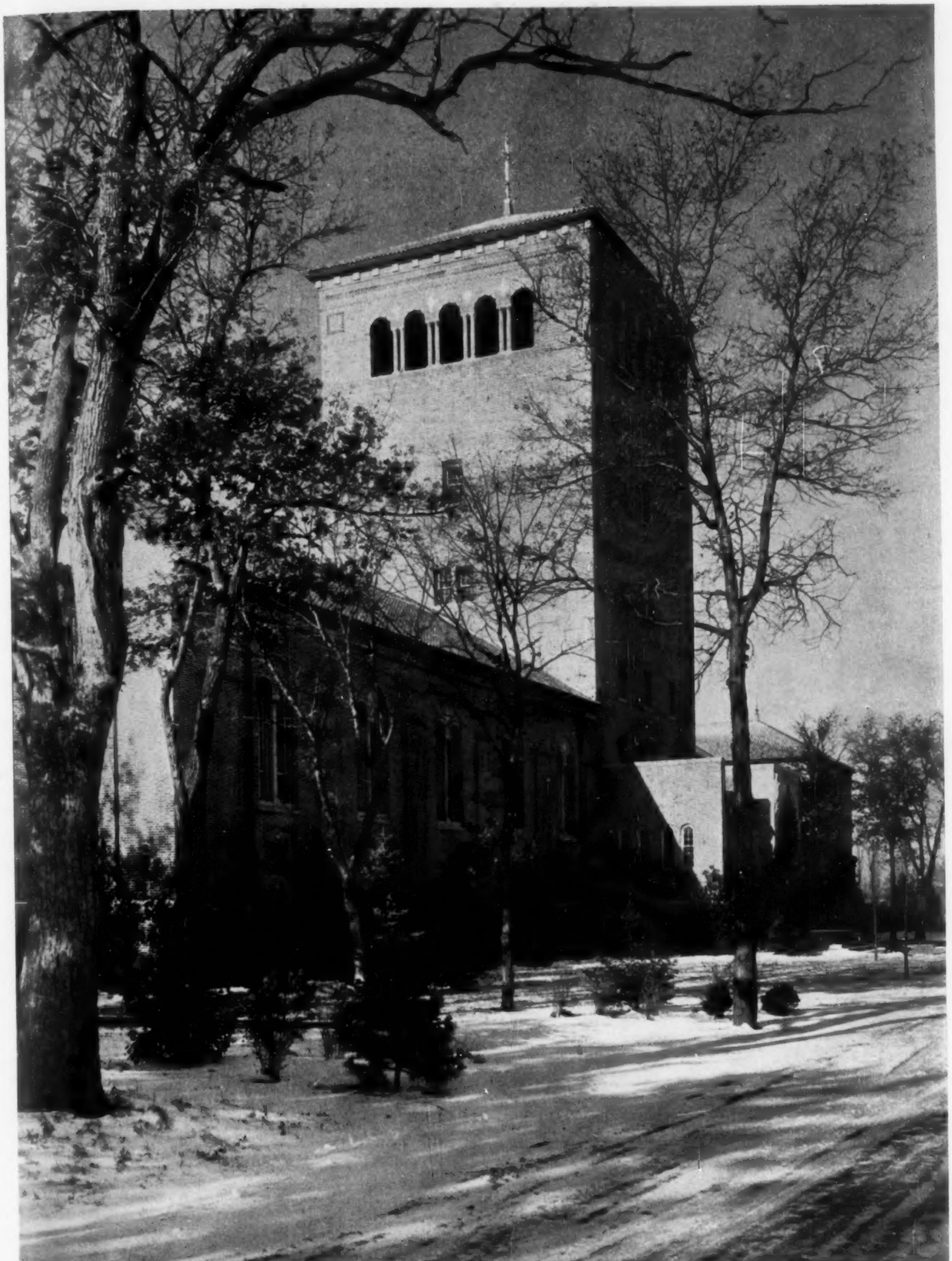
over the inner main tower doorway, where Mr. Rubins of Minneapolis has painted a mural in a rarely rich and sonorous color scheme.

Both A. H. Atkins and Sidney Woolett of Boston have enriched the interior with figures of exceptional merit. The Virgin and Child by Mr. Atkins would satisfy a rational exponent of modern sculpture, and yet it closely adheres to tradition in the folds of the draperies and the Oriental exactness of the head dress. The figure of the Boy Christ by Mr. Woolett, is a charming example of intelligent realism. The ironwork was done by that most genial and talented craftsman, Frank L. Koralewsky, whose work is well known to all connoisseurs. Surely it is futile to mourn the passing of mediæval workers when the force of their traditions is in evidence today, as shown by Mr. Koralewsky's work. We have but to seek and encourage good, honest craftsmen and they will not be found wanting,—and conversely we must discourage cheap, showy imitations by commercial firms whose one thought is the quantity and not the quality of their work.


Two of the Windows by Charles J. Connick in the Seminary Chapel, Nazareth Hall

A memorial shrine,—of limestone, both exterior and interior,—is set like a jewel upon an island woodland at the tip of the property and accessible by means of a rustic bridge. His Grace, Archbishop Dowling, of St. Paul, was pleased to call this shrine "a bijou Gothic chapel." In this little building there is a triptych which contains a painting by Frank Schwarz, of New York, a young and rising painter of distinction. The subject is "the Adoration of the Peasants" and the types used by Mr. Schwarz were found by him among the inhabitants of an Italian mountain village whither he had retired to study the customs and habits of the simple and faithful country folk. The windows and the mosaic panel above the entrance of the shrine were executed by Charles J. Connick, of Boston. Mr. Connick also designed and executed the windows in the seminary chapel. These windows are of the medallion type, so fully developed by the old masters of the twelfth and thirteenth centuries. The same spirit and ideals which actuated those craftsmen obtain throughout this series. Design is the predominant consideration and second only to the jewel-like radiance of pure color. The figures are not archæological, but, as in the ancient medallions, the entire figure rather than the features alone is made to express the idea. These windows are in groups of two each and have alternating background designs,—a foliated scroll *motif* contrasting with a more formal rectangular scheme. In the latter case large standing figures are represented in the upper portions of the windows. The subjects were chosen for their appropriateness to a preparatory seminary. Incidents from the lives of youthful Biblical characters predominate, and the stories are told in a direct and forceful manner.

Perhaps the reader of this review will be interested in knowing that a member of the seminary faculty instructs in the history of architecture. A knowledge of the various great epochs in the history of art will be an asset to those who will, some day, undertake the building of churches and parish groups. Would it be too sanguine to hope that the study of architecture in these seminaries may direct the attention of the students to a rational understanding of styles and to a realization that no style can claim to be exclusively "religious?"—and that the necessities of the times and the materials at hand should dictate whatever style a building should have? Nazareth Hall may well be taken as such an example.

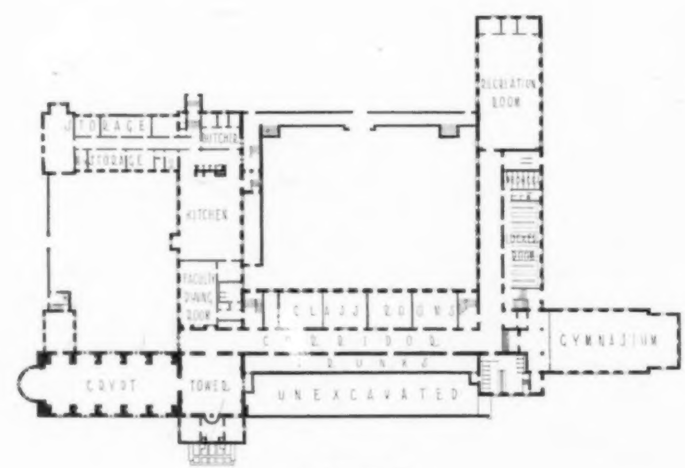


*Photos. Paul J. Weber*

*Plans on Back*

THE GREAT TOWER AND THE CHAPEL
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS

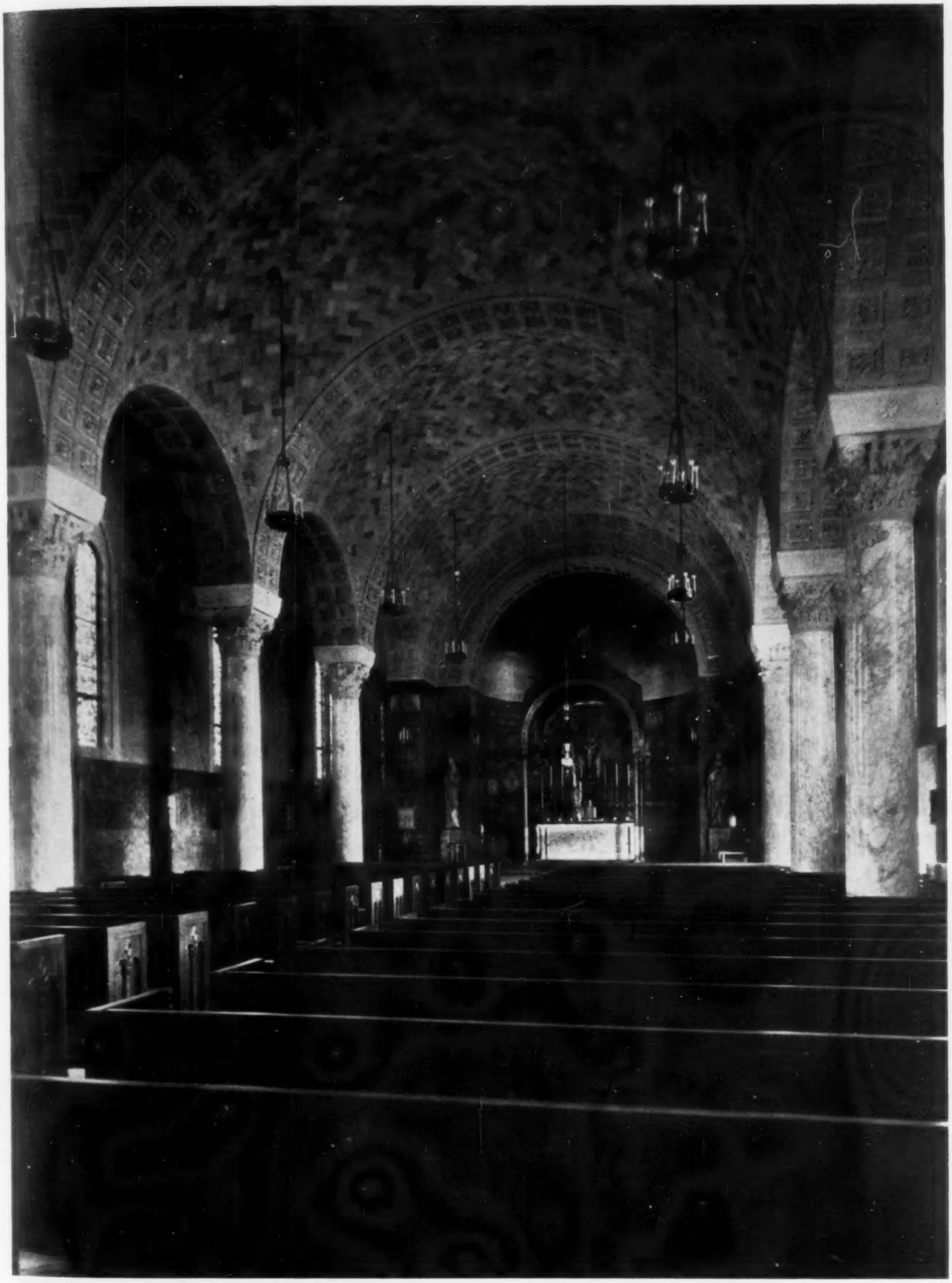

MAIN FLOOR




BASEMENT

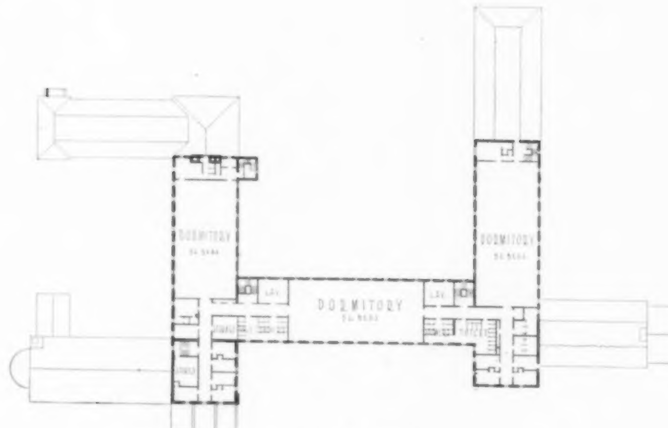
PLANS, NAZARETH HALL, ST. PAUL

MAGINNIS & WALSH, ARCHITECTS

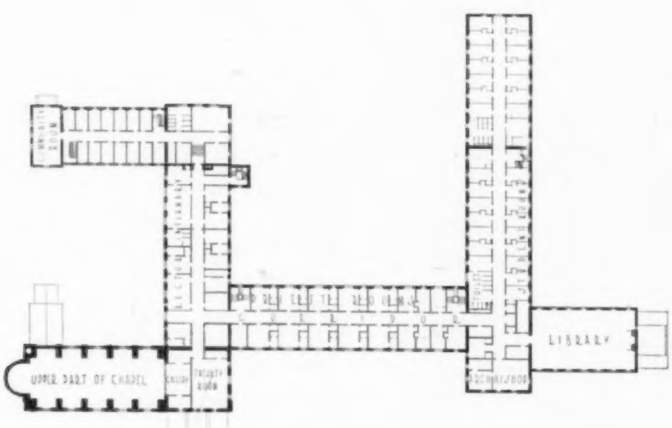


*Plans on Back*

THE SANCTUARY, FROM THE ENTRANCE OF THE CHAPEL
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS




THIRD FLOOR



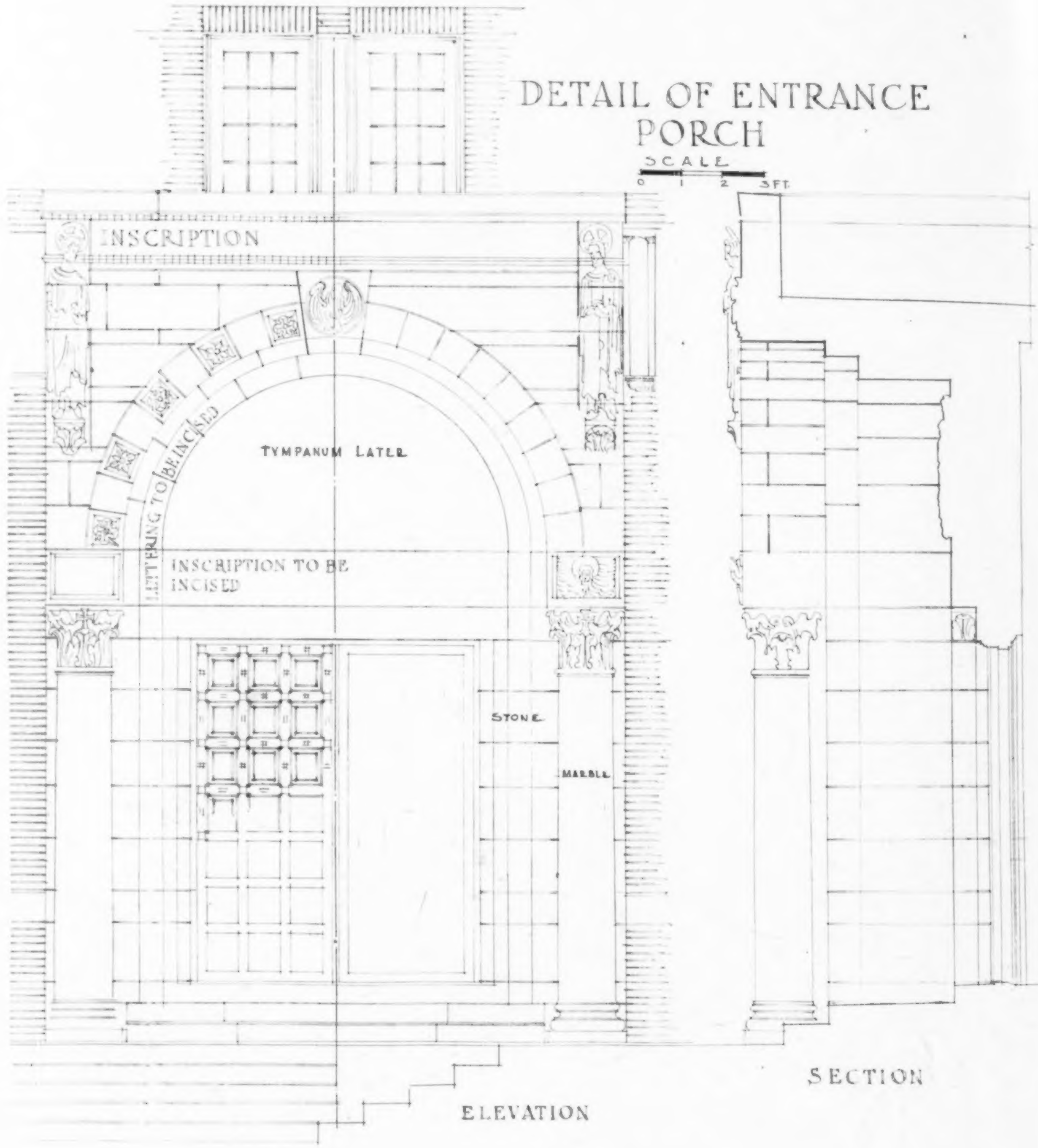

SECOND FLOOR

PLANS, NAZARETH HALL, ST. PAUL

MAGINNIS & WALSH, ARCHITECTS

*Detail on Back*

THE MAIN ENTRANCE
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS



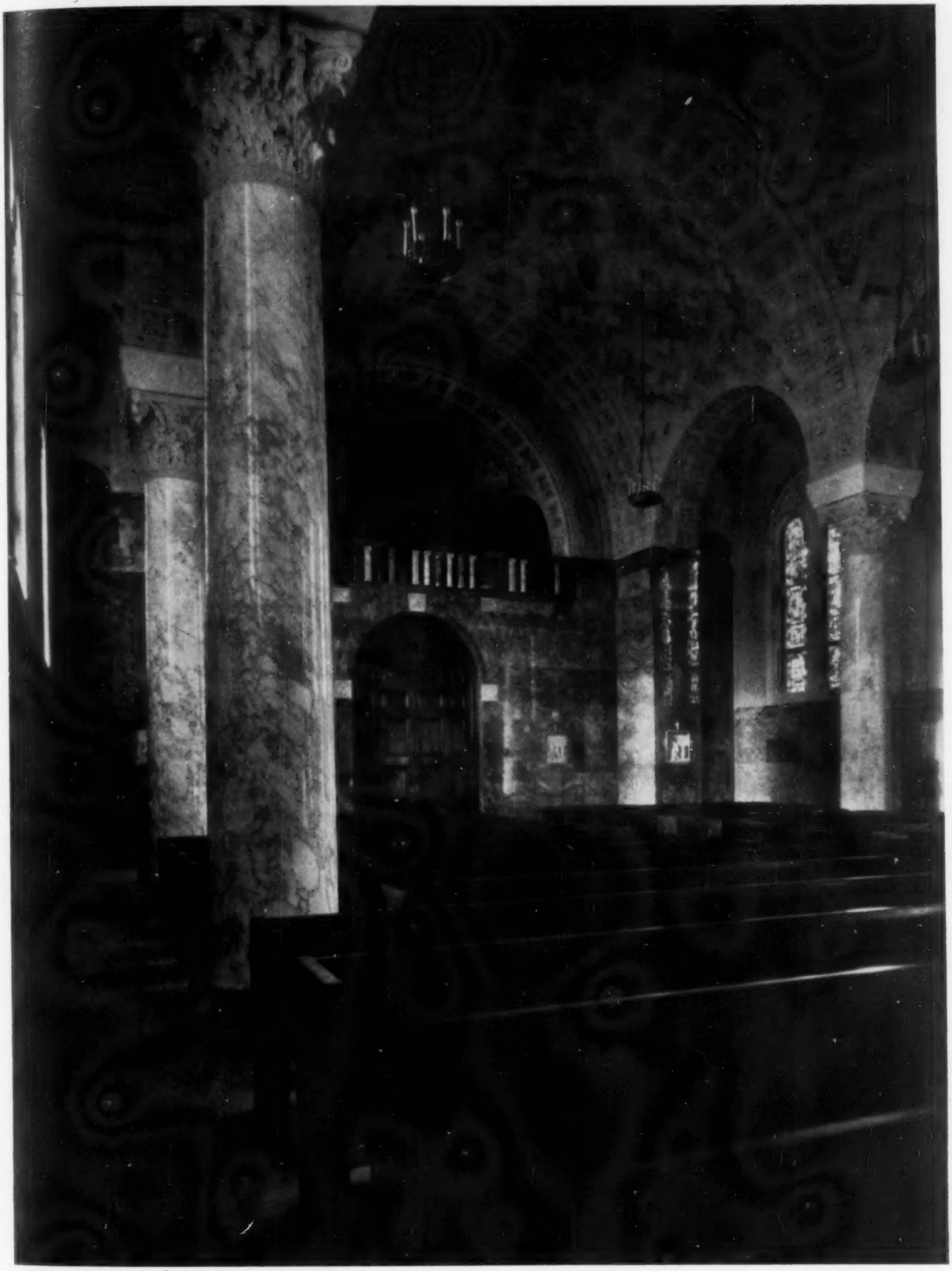

NAZARETH HALL, ST. PAUL

MAGINNIS & WALSH, ARCHITECTS

MAY 1928

No. 67

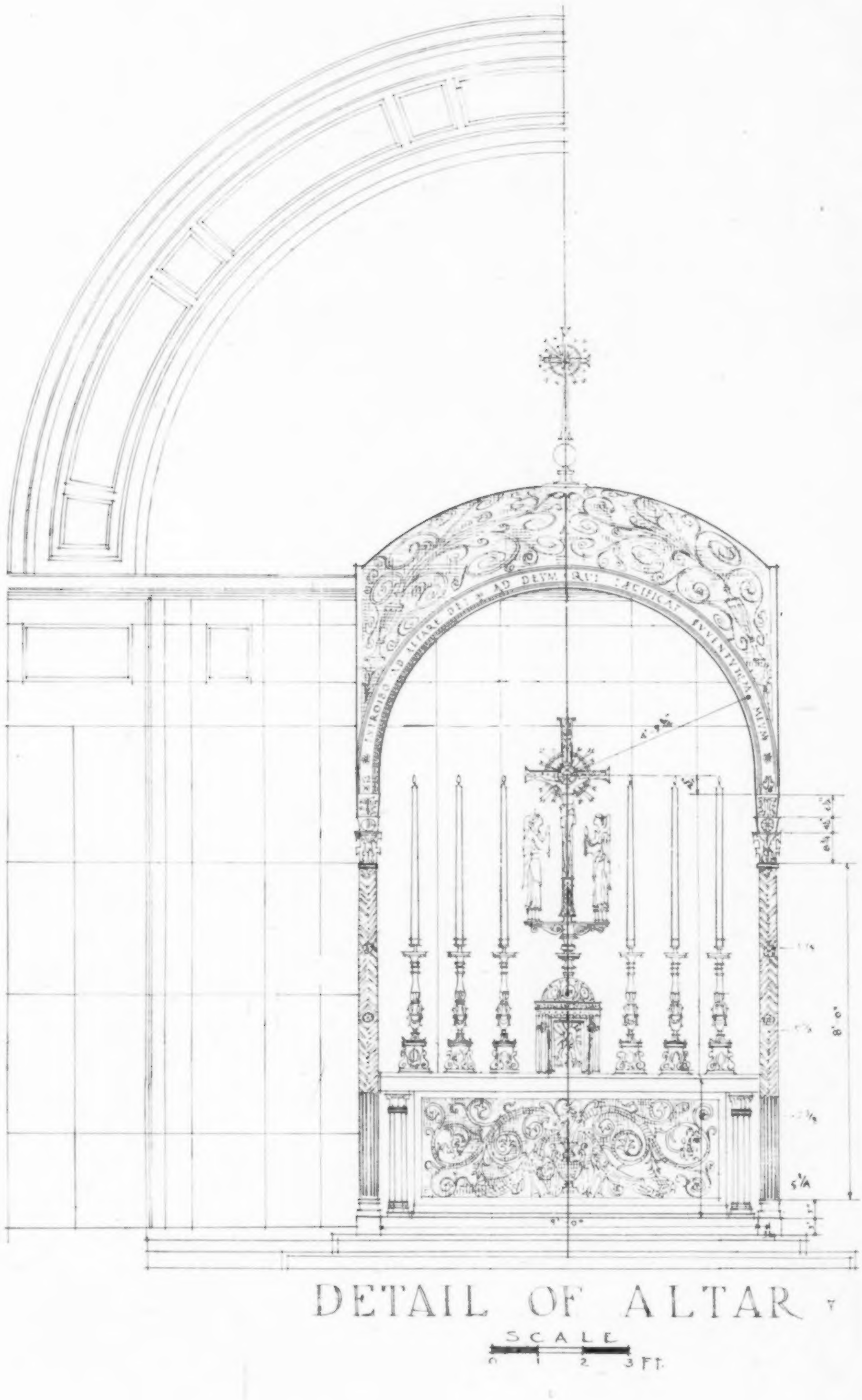
The ARCHITECTURAL FORUM DETAILS



ENTRANCE AT THE WEST END OF THE CHAPEL
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS

*Detail on Back*

ALTAR AND BALDACHINO IN SANCTUARY OF THE CHAPEL
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS




NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS

MAY 1928

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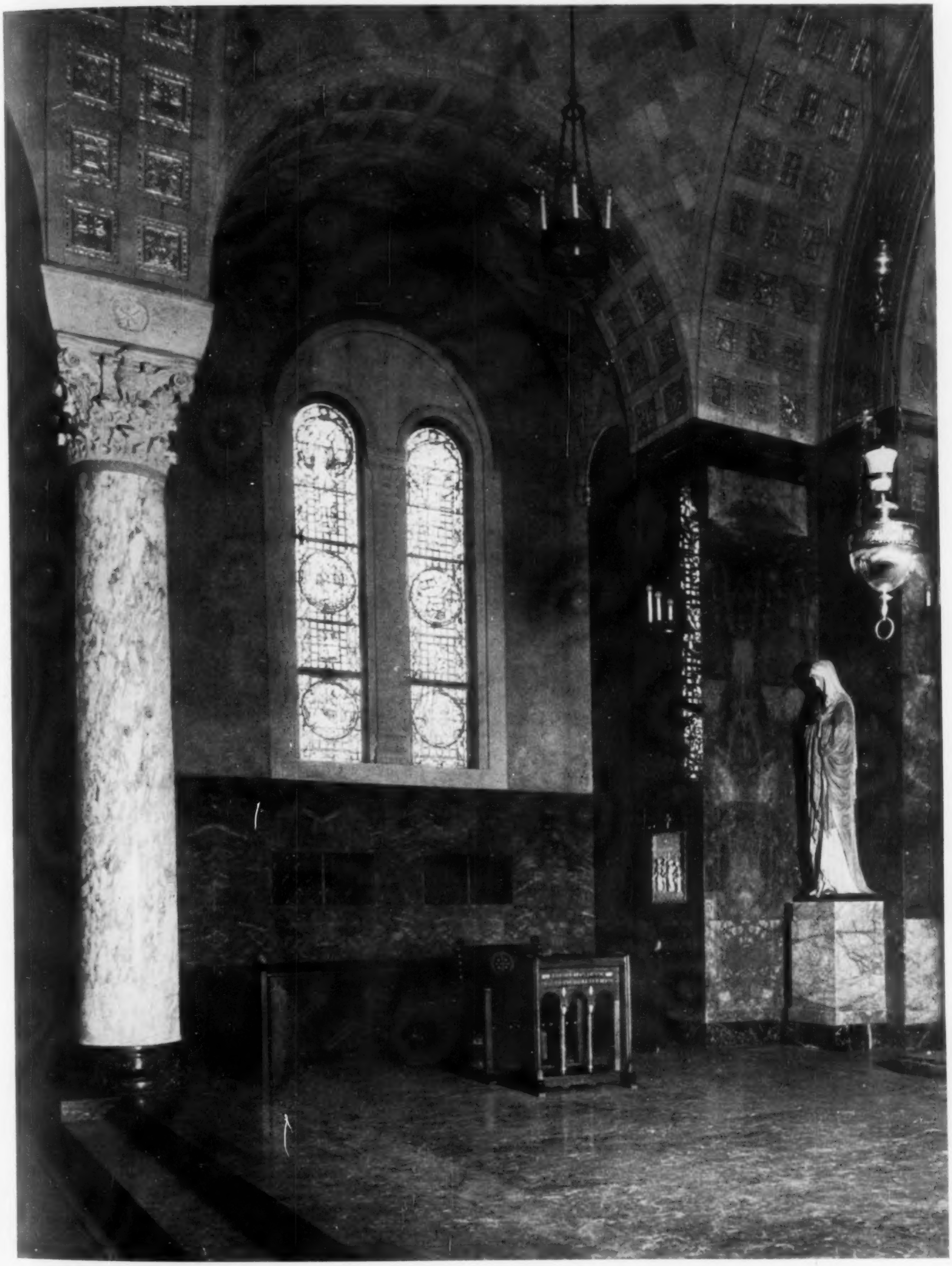
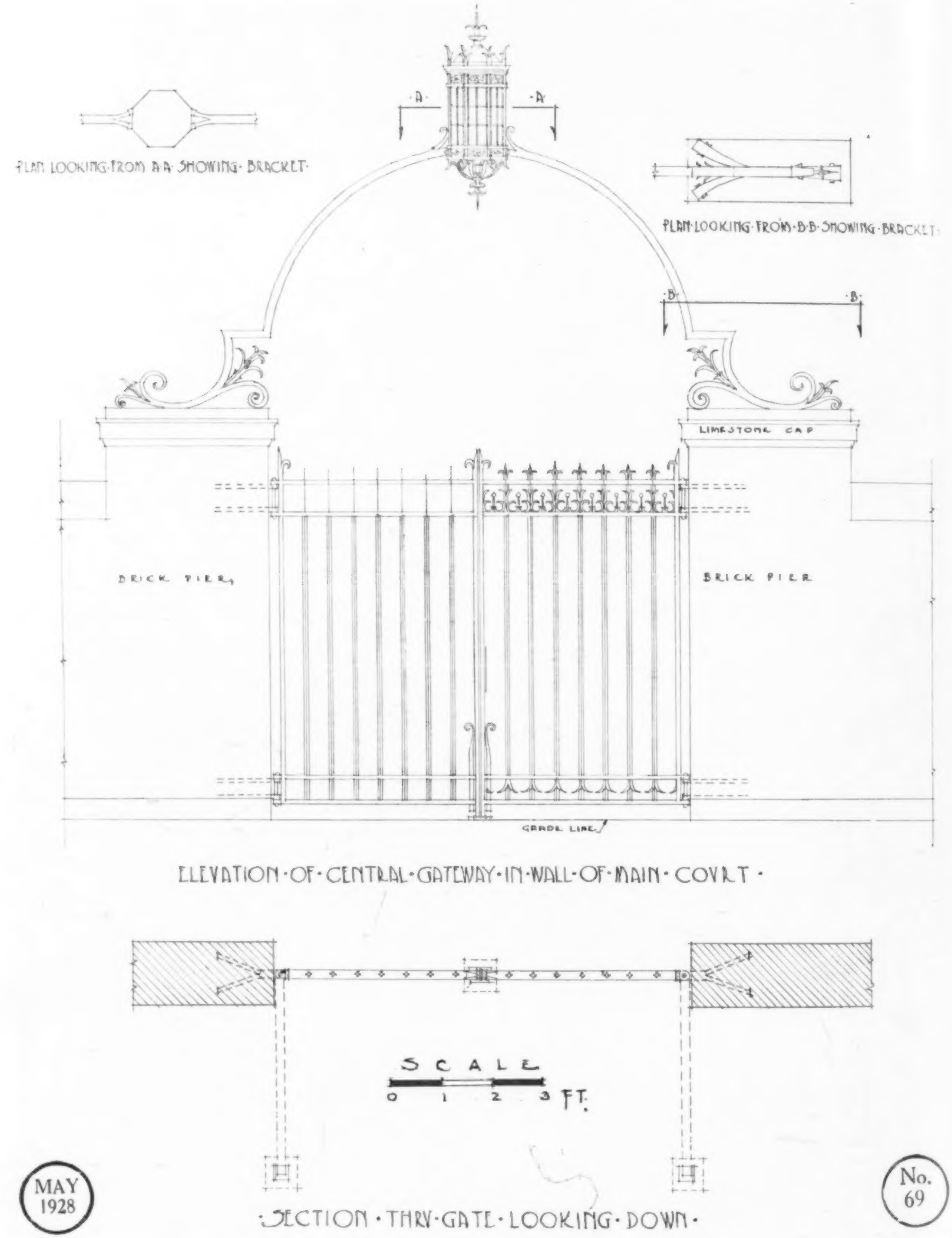
# The ARCHITECTURAL FORUM DETAILS



ONE OF THE CHAPEL BAYS
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS

*Detail on Back*

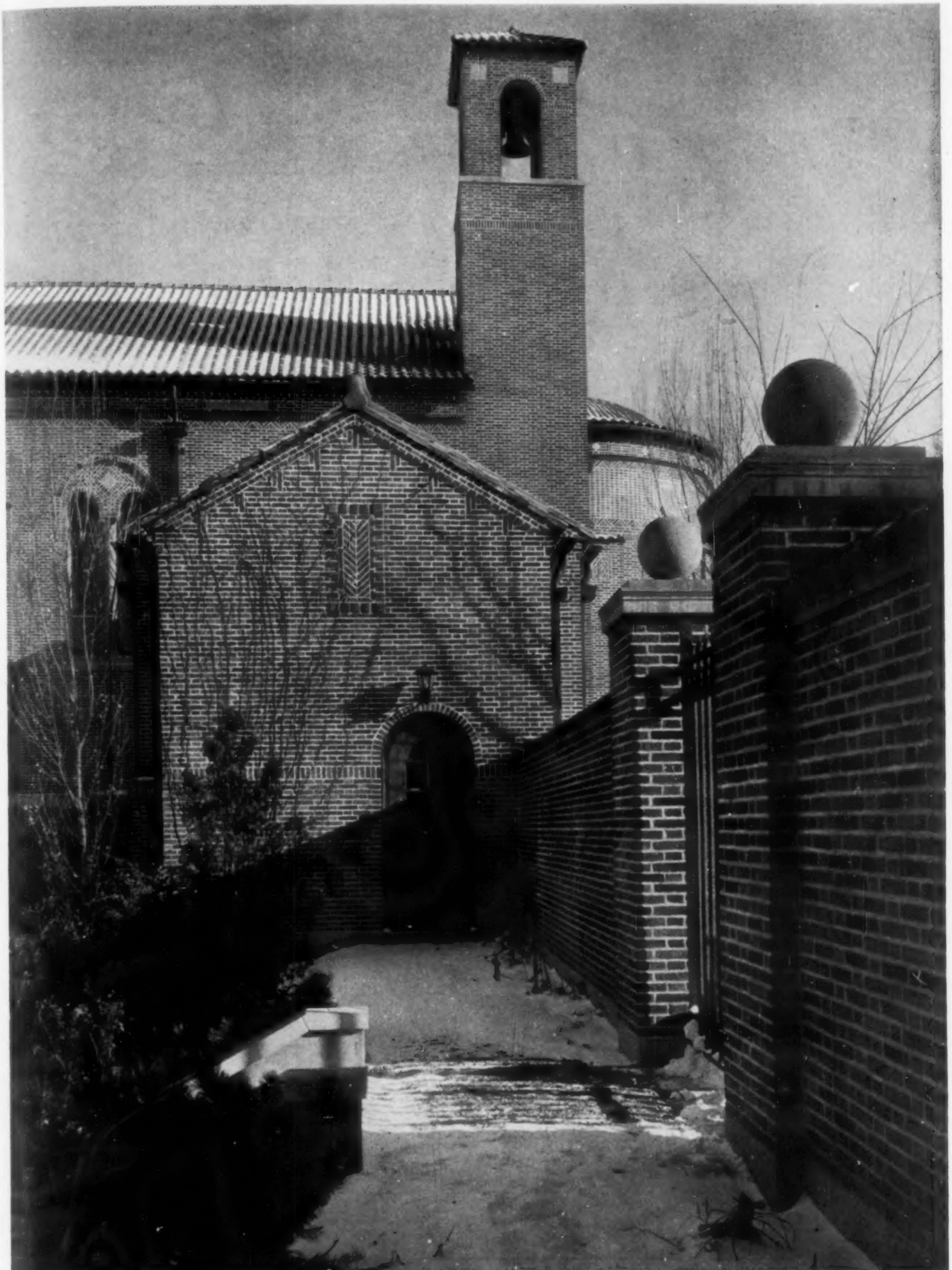
ENTRANCE TO THE WEST COURT
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS




MAY 1928

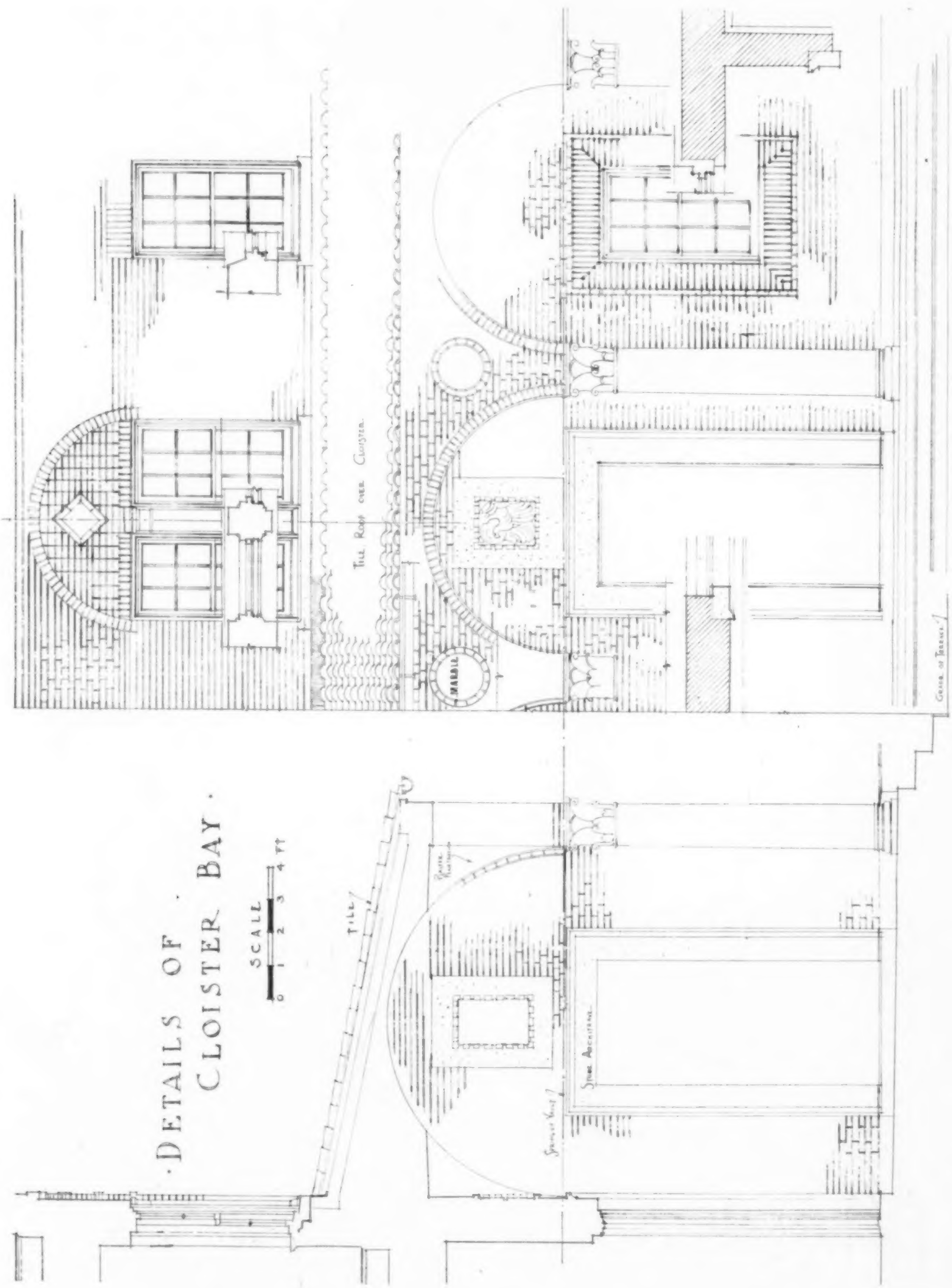
No. 69

# The ARCHITECTURAL FORUM DETAILS



*Detail on Back*

ENTRANCE TO THE SACRISTY FROM THE EAST COURT
NAZARETH HALL, ST. PAUL
MAGINNIS & WALSH, ARCHITECTS




NAZARETH HALL, ST. PAUL

MAGINNIS & WALSH, ARCHITECTS

MAY 1928

No. 70

# The Architectural Forum Details

Editor's Note: See Illustration on Page 635

# THE DETROIT MASONIC TEMPLE

GEORGE D. MASON & COMPANY, ARCHITECTS

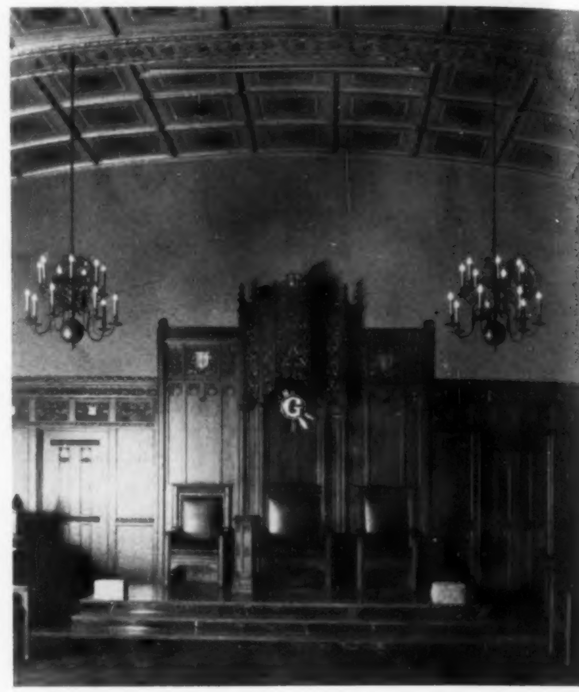
THE fact that the Detroit Masonic Temple has attracted the attention of architects and laymen throughout the country is primarily due to its having solved a most complicated problem; a result has been achieved which has architectural merit of a high order. To the fraternity it is a matter of interest that for the first time all Masonic bodies are housed in one building, requiring a structure containing 12,000,000 cubic feet, making it the largest and most complete structure of its kind in the world. Some idea of the complex nature of the problem may be gathered from the fact that there are 28 units in the building, providing for 50 Masonic bodies which must operate independently, and that in the aggregate a capacity crowd in each of these units amounts to 16,000 people. The large auditorium seats 5,000, the Consistory Cathedral 1,700, the Commandery Asylum 500, the Third Degree Auditorium 750; 6,000 people can sit down at one time in the various banquet and dining rooms and be served in 45 minutes, and the service varies from grill room a la carte to that of formal banquets. The divisional feature, which was imperative, was made to apply not only to the strictly Masonic portions but to rooms for club and social activities as well. Furthermore, it was necessary to correlate these various divisions that free and easy access may be had from one to another, should their joint use be found necessary on occasions when the attendance is unusually large.

The large general divisions comprise, at the left, the tall portion, the Ritual Building, 14 stories in height, housing 26 Blue Lodge bodies; the Consistory; two Commanderies and five Chapters. In the center is the large auditorium, over which are the drill hall and armory; and on the right the Shrine Club, a building containing generous lounges, billiard rooms, natatorium, gymnasium, 100 guest rooms and a dormitory. It will be noted that there are two entrances to the Ritual Building, one for the Scottish Rite and the large entrance for the York Rite and Blue Lodge bodies. The majority of the Blue Lodge rooms have not been planned for large seating capacity, as it is found that for the first two degrees the attendance is seldom more than 100, but for the third degree the attendance would tax even those lodge rooms with a large seating capacity. A unique room, therefore, was prepared for this work on the top floor, having a seating capacity of 750. It is as if the south wall of a lodge room were removed and the spectators were outside looking in. The north wall of this lodge room opens on a stage where the dramatization of the third degree takes place. The interior of this room has not as yet been completed, although there will be need for it, as the memberships of the large lodges increase. It should make a very fine setting for the work. As the Consistory required a separate entrance to the building, so also it was required that its quarters be isolated from the rest of the structure during reunions; but it will be noted that at those times the banquet and ball

Greek Chapter Room

Corinthian Lodge Room

Red Cross Room

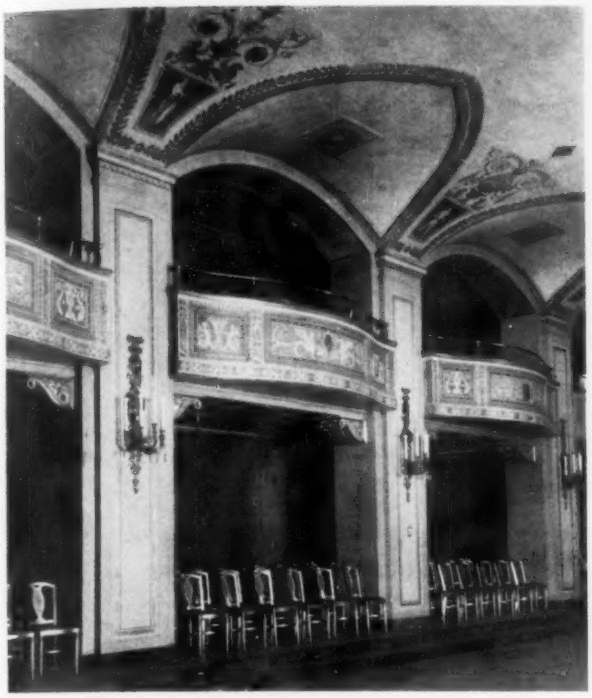


Gothic Lodge Room

room immediately below with parlors, etc., are accessible from their rooms by way of two stairways leading directly from the lounge and parlor of their quarters. Again, the Consistory lounge and parlor with their check rooms, etc. are available, with direct access to the large auditorium when this auditorium is being used for reunions and special gatherings. The Commandery Asylum has been planned with a church setting in mind, and due to its excellent proportions and stone treatment it forms an admirable background for the work of the Knights Templars. The Red Cross room and the Commandery parlor adjoin the Asylum and, easily accessible by means of ramps, are the armories and drill hall which are housed in the spans over the large auditorium. In connection with the armories are the dressing rooms and showers, which again give access to the natatorium. This pool, with all its accessory features, serves also the gymnasium in the Shrine Club and is approached from the building on the same level.

An interesting feature of the large auditorium is due to the fact that the sight lines were determined by the proposed 70-foot apron extension to the stage, which when in use covers the permanent seating, as in a pit. This extension was to have been used during Shrine ceremonials. While this apron has not as yet been used, this sight line layout has given a quality of intimacy to the room which in itself is widely commented upon, and is indeed exceptional in a theater of this size. Two-thirds of the audience is visible to each spectator without turning around. This auditorium was planned primarily for the ceremonials of the Moslem Shrine, and the various rooms adjoining had reference to its needs, and these needs encroached considerably upon the lobby space which for an auditorium of this size may appear inadequate. Yet the crowds are well handled, and the entire auditorium can be emptied in seven minutes. The stage is 55 x 110 feet in size, with a 65-foot proscenium. The Chicago Civic Opera Company gave Detroit a week of grand opera in this auditorium in February. Due in some measure to the form of the room, the low ceiling and the balcony arrangement, together with the use of acoustic material in some parts of the ceiling, the acoustics are perfect. It will be noticed that the rooms for social activities and the majority of the club features are, for obvious reasons, below the first floor level. The two large divisions are the two banquet and ball rooms, with their separate kitchens and serving rooms. The supper rooms in the basement are used for lodge banquets and may be thrown together to give any desired seating up to 1,200, and are served from the main kitchen. These rooms are accessible from the Shrine Club, which has no separate dining room or kitchen service. These basement rooms are in constant demand by the public as well as by different Masonic bodies, and the facilities for catering are such that it is now being planned to convert the trophy room into a cafeteria grill accessible from the elevator lobby. This feature, together with the grill room in the basement, will offer the casual diner a choice of service such as may be obtained only in a first class hotel. It may be mentioned that the two ball rooms are frequently used together, one being set up for banquets and the other for dancing, there being access from one to the other by two corridors.

The name "Temple" as applied to a Masonic building seems to stick, and has its origin possibly in the original tradition regarding King Solomon's Temple.



Crystal Ball Room

Commandery Asylum

However, in this case tradition was broken with, and the Detroit "Temple" would more appropriately be called the "Masonic Cathedral." The precedents for fraternal buildings are all in Greek or Egyptian. Nothing of the sort had been done in Gothic, yet the architects felt that this style best expressed the traditions of Masonry,—Solomon's Temple and the beautiful Scottish Rite Cathedral in Washington to the contrary notwithstanding. Certainly the spirit and tradition of the Knights Templars and the historical settings of the Scottish Rite are Gothic, and operative Masonry, having its origin in the guilds of Europe, has the tradition of the great cathedrals of which they were the builders. It was fortunate that this feeling was shared by the building committee, for to have attempted to clothe the complicated plan evolved after some three years of study with a classic facade, would have led to compromise and a result to be plainly labeled a fake. The flexibility of the Gothic is here very apparent, and certainly the result has justified the selection of this style.

The building, on a site 190 x 400 feet, crowds the lot lines, but fortunately it faces a beautiful park from which a general view is obtained. It dominates its surroundings, due more to its massiveness and general vertical feeling than to its size or height, which at the highest parapet is 210 feet. This massive effect has been obtained by the bold treatment of the stair towers, the deep reveals, and a silhouette of great interest and variety. The Gothic character has been carried out in the interior generally, although in the various lodge rooms the usual variation of styles has been observed. The small lodge room in decorated plaster is Romanesque. There is an Egyptian room, a Greek Doric, two in Greek Ionic, a Corinthian, Italian Renaissance, Byzantine and Gothic. There being but ten lodge rooms, the orders were soon exhausted, although apparently for some reason the Composite was never considered.

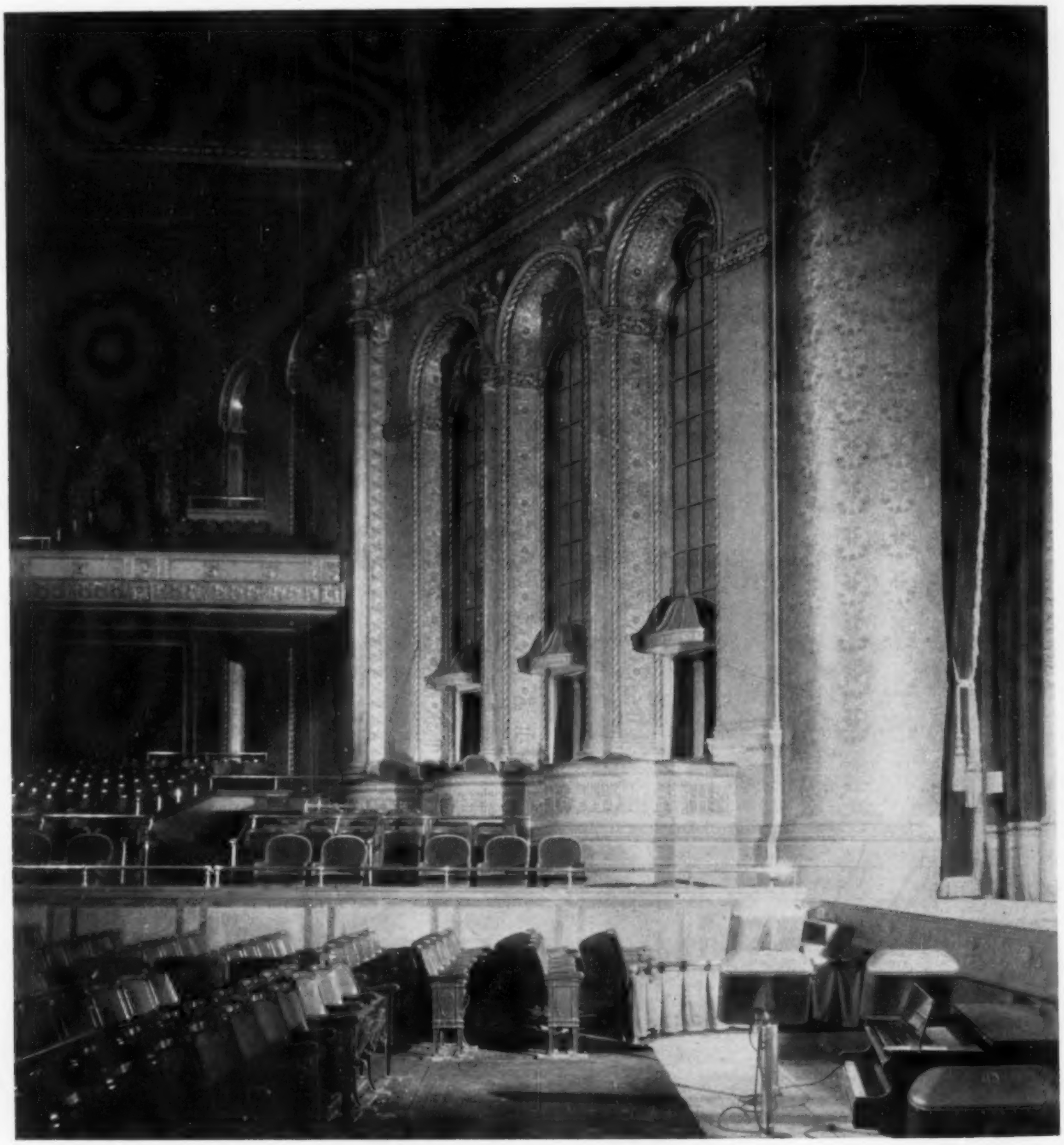
The large auditorium has considerable detail adapted from the Venetian Gothic, and in the handling of the color decoration its character has been consistently carried out. While the general tone is gold, this has been enlivened with red and blue to produce a quiet richness of color seldom attempted in this type of work. Twenty-six rooms in all have been carefully studied, having in mind color decoration, which while never attempting the unusual has produced in every case results which are pleasing in their general richness and in harmony with the general character. The crystal ball room ceiling and the treatment of the concrete beams in the main entrance lobby are among the details which are interesting.

In the early stages of the development of the working drawings a carefully studied model at 3/16-inch scale was prepared. This was very helpful in the study of details, as slight modifications of moulded work and ornament were found advisable as the model was prepared. There are many sculptured figures on the exterior; eight at the top of the building measure 14 feet in height and represent guards and knights in armor. Those below over the main entrance, about 7 feet in height, were modeled by Friedlander and represent the three characters involved in the dramatization of the third degree. All of these figures were modeled at one-half full size. The symbolism of the order was introduced in the carving in the lower portions of the building and carries 40 or more different *motifs*. It is interesting to note that the lighting fixture contract called for

the greatest number of special fixtures of any building in the country. There is a great variety of styles, all well studied and in perfect scale. The two 8-foot diameter fixtures in the main auditorium are unusual in design and are relied upon to break up a flat ceiling. They have a jeweled effect, and with red, blue and amber on dimmers, a great variety of interesting lighting effects is possible. These fixtures were the work of the late Mr. Kinsman's organization, and its coöperation with the architects in every phase of work left nothing to be desired.

The selection of materials was governed to a large extent by considerations of economy and durability. Marble has been used extensively for floors, bases and stair treads, but limited to travertine, American verde antique and a Vermont gray. The woodwork generally throughout is of white oak, and the sand-finish plaster is glazed. An imitation stone having remarkable properties of hardness was relied upon for textural effect in a great number of the rooms, and that the result is satisfactory is due entirely to the expert and painstaking work of the plasterer.

The final preliminary drawings for the building were approved in June, 1920. The first sod was turned on Thanksgiving Day, 1920, the cornerstone laid exactly two years later with 30,000 people witnessing the ceremony, and the building was finally dedicated on Thanksgiving Day, 1926. The long period of building was due to the policy of the committee of taking advantage of fluctuations in building costs and, insofar as possible, letting contracts only when the financial resources were sufficient for the period. This delay saved the association something more than $1,000,000 over the original estimates.



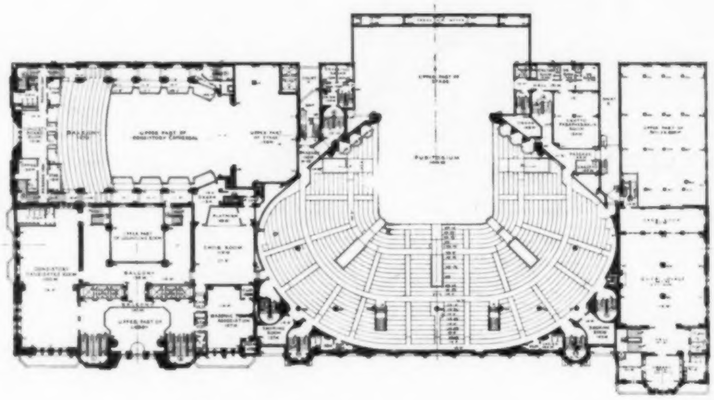
Main Auditorium, Detroit Masonic Temple
George D. Mason & Co., Architects

Photos. Thomas Ellison

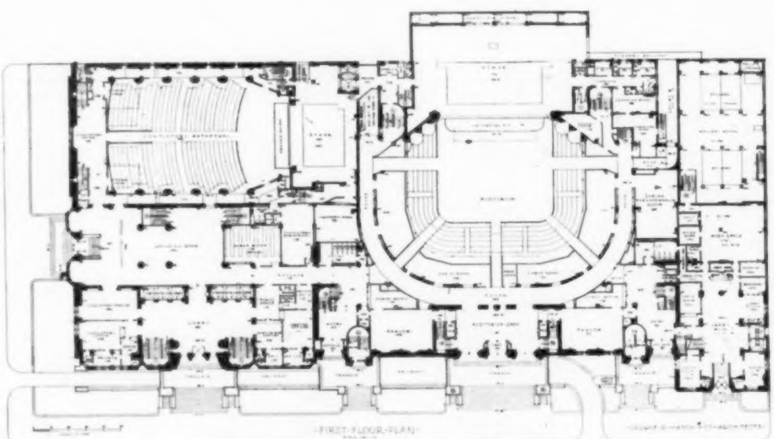
Plans on Back

DETROIT MASONIC TEMPLE FROM CASS PARK

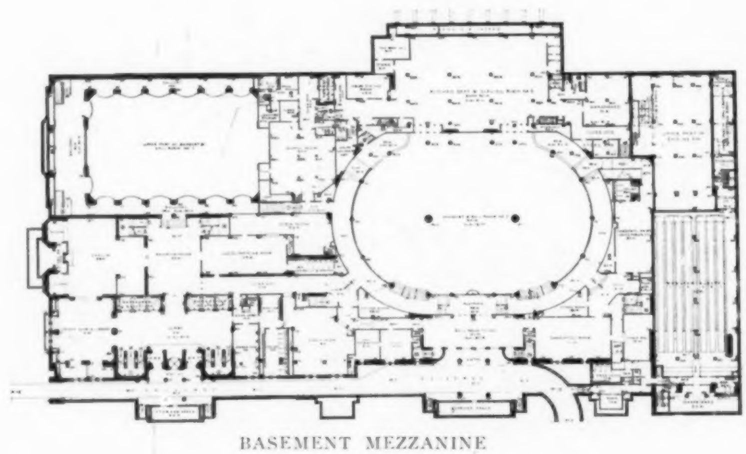
GEORGE D. MASON & CO., ARCHITECTS



FIRST FLOOR MEZZANINE



FIRST FLOOR



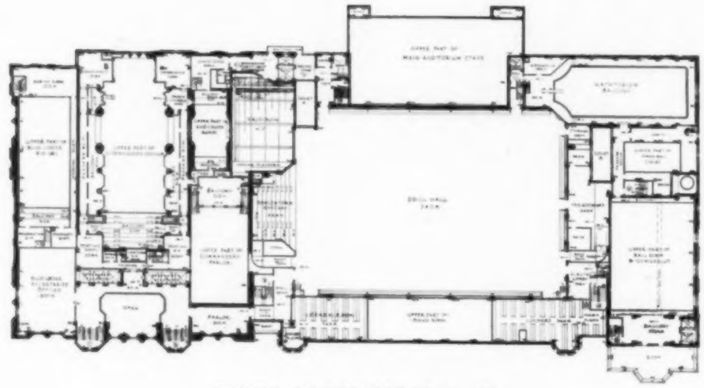
BASEMENT MEZZANINE

PLANS, DETROIT MASONIC TEMPLE

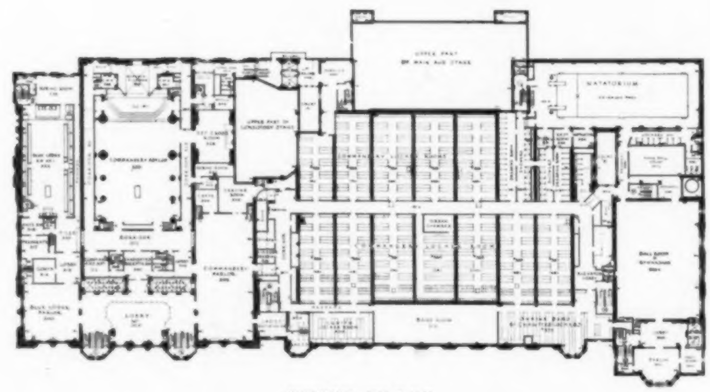
GEORGE D. MASON & CO., ARCHITECTS

*Plans on Back*

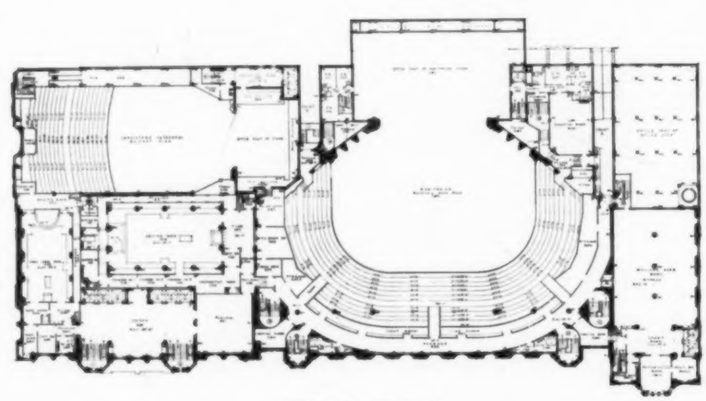
PART OF AVENUE FRONT, DETROIT MASONIC TEMPLE
GEORGE D. MASON & CO., ARCHITECTS



THIRD FLOOR MEZZANINE



THIRD FLOOR



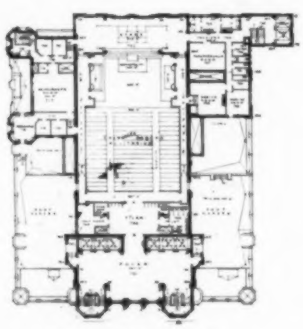
SECOND FLOOR

PLANS, DETROIT MASONIC TEMPLE

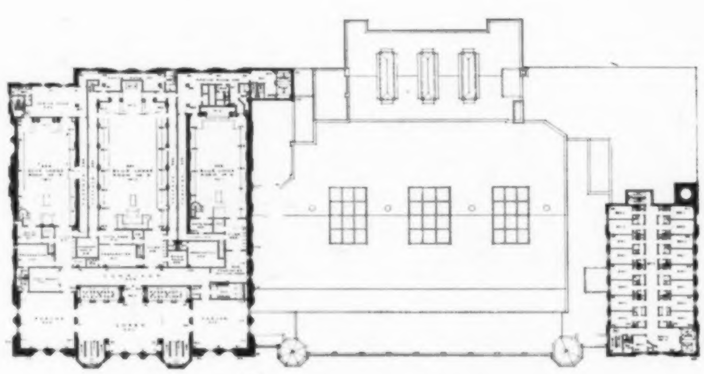
GEORGE D. MASON & CO., ARCHITECTS

Plans on Back

ONE ENTRANCE TO AUDITORIUM, DETROIT MASONIC TEMPLE
GEORGE D. MASON & CO., ARCHITECTS

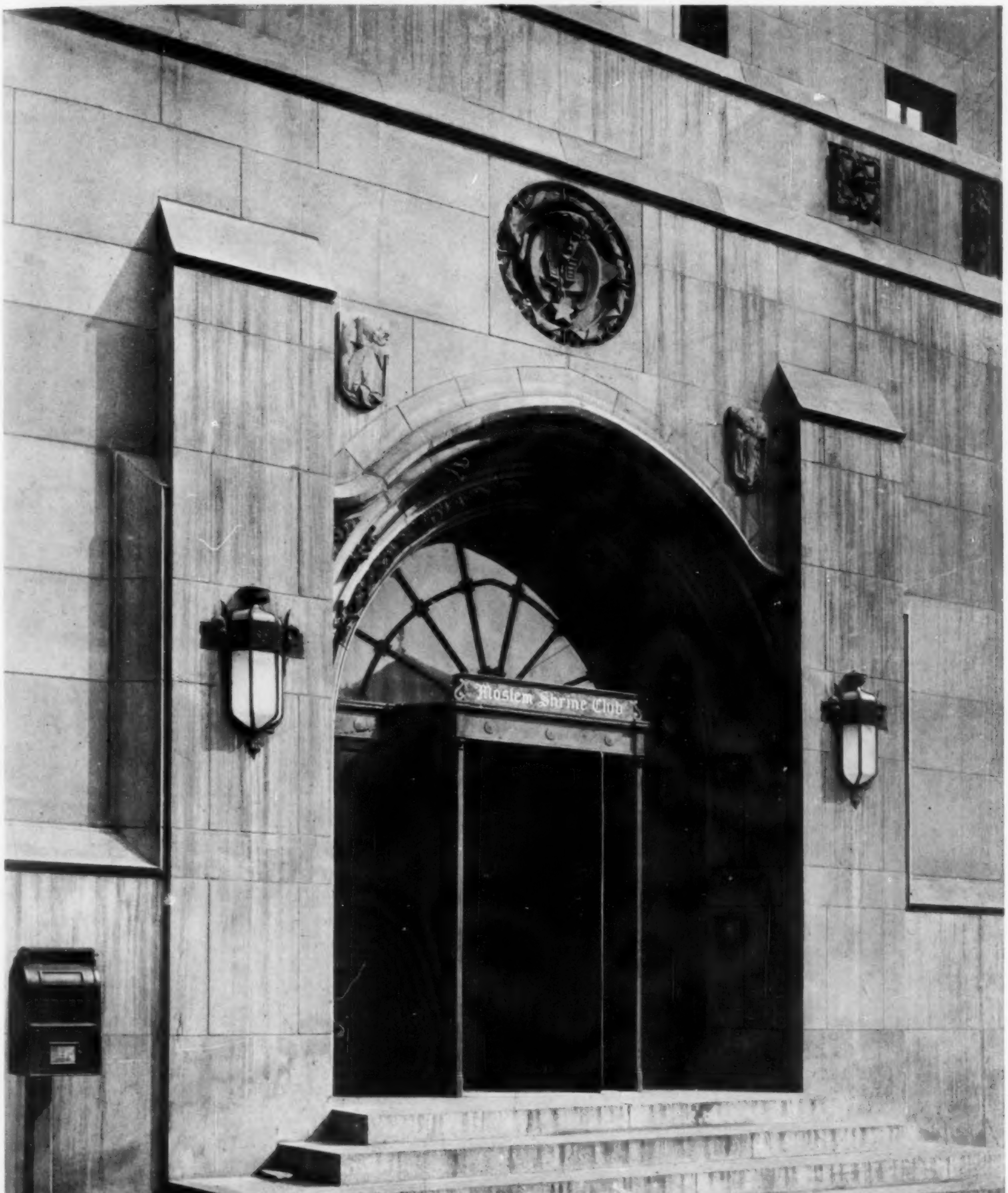


SEVENTH FLOOR

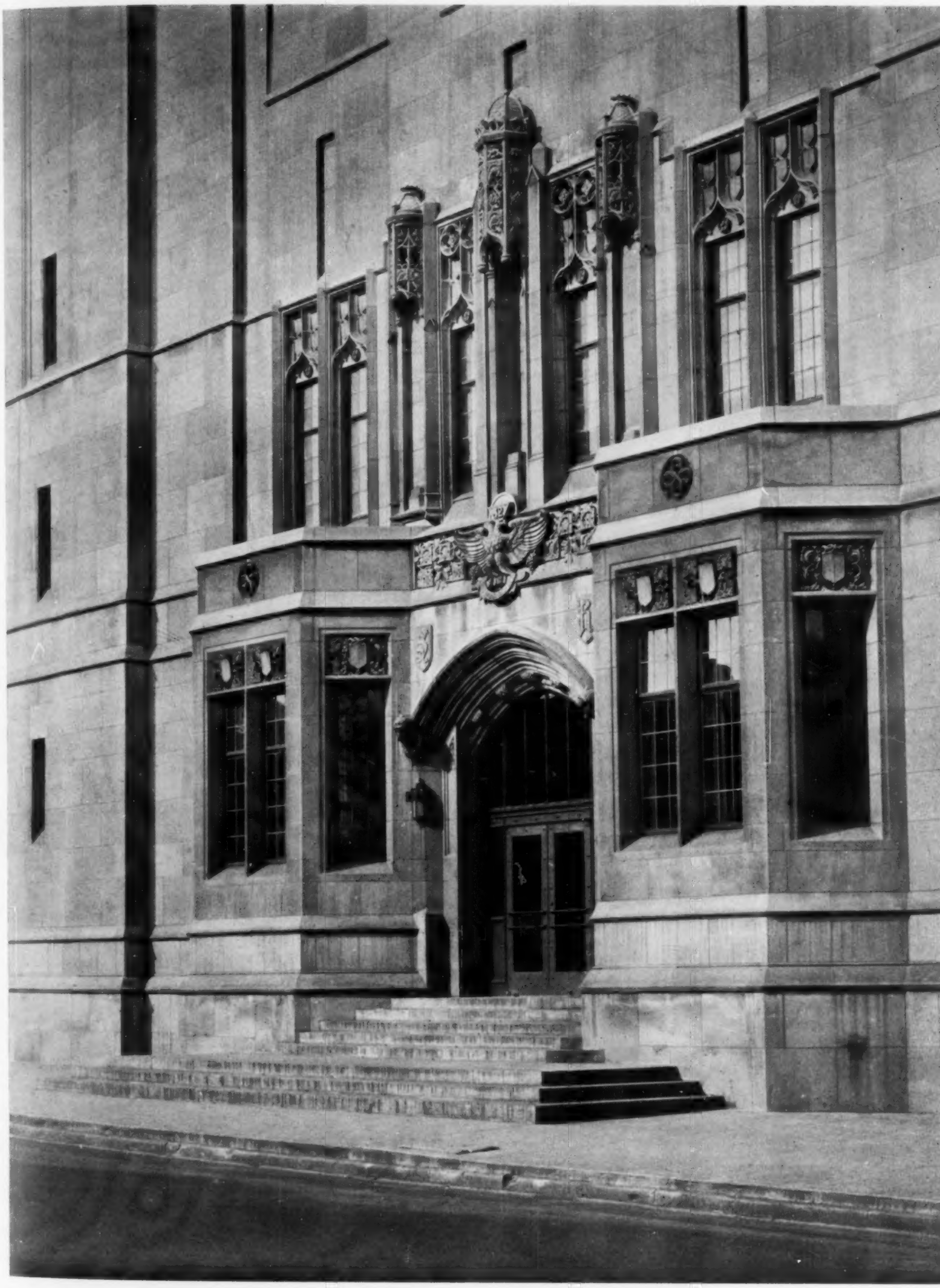


FIFTH AND EIGHTH FLOORS

PLANS, DETROIT MASONIC TEMPLE
GEORGE D. MASON & CO., ARCHITECTS

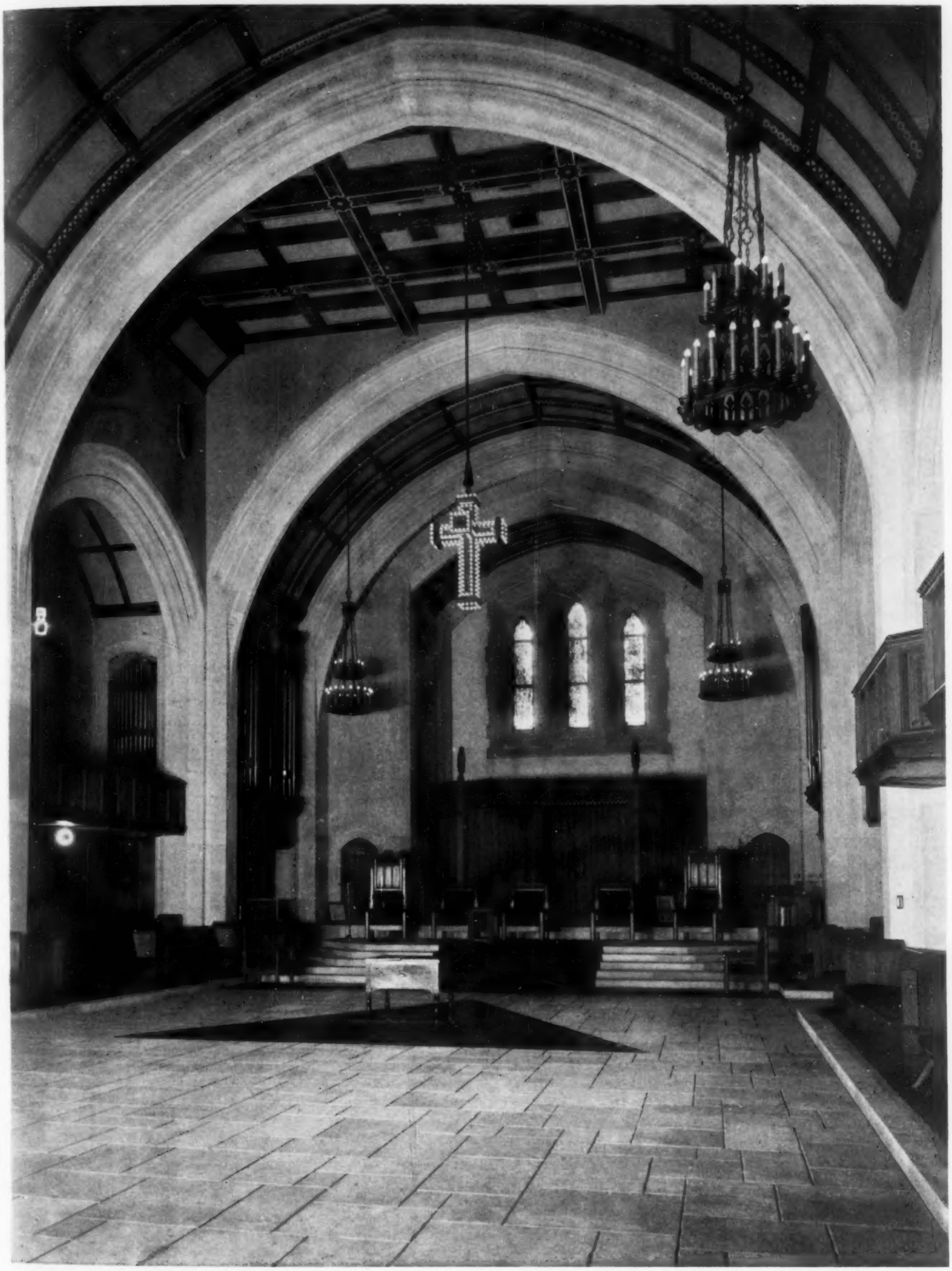



ENTRANCE, MOSLEM SHRINE CLUB, DETROIT MASONIC TEMPLE
GEORGE D. MASON & CO., ARCHITECTS



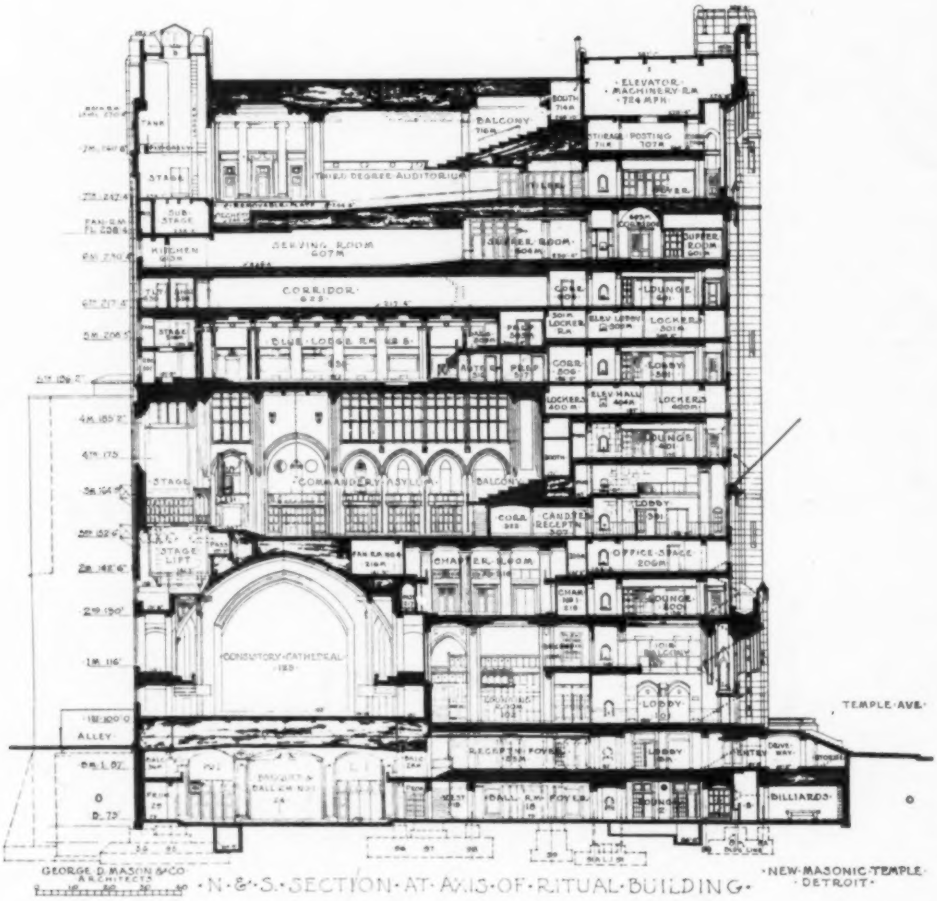
ENTRANCE TO SCOTTISH RITE CATHEDRAL, DETROIT MASONIC TEMPLE
GEORGE D. MASON & CO., ARCHITECTS

UPPER PART OF STAIR TOWER, DETROIT MASONIC TEMPLE
GEORGE D. MASON & CO., ARCHITECTS



*Section on Back*

COMMANDERY ASYLUM, DETROIT MASONIC TEMPLE
GEORGE D. MASON & CO., ARCHITECTS




NORTH AND SOUTH SECTION, DETROIT MASONIC TEMPLE

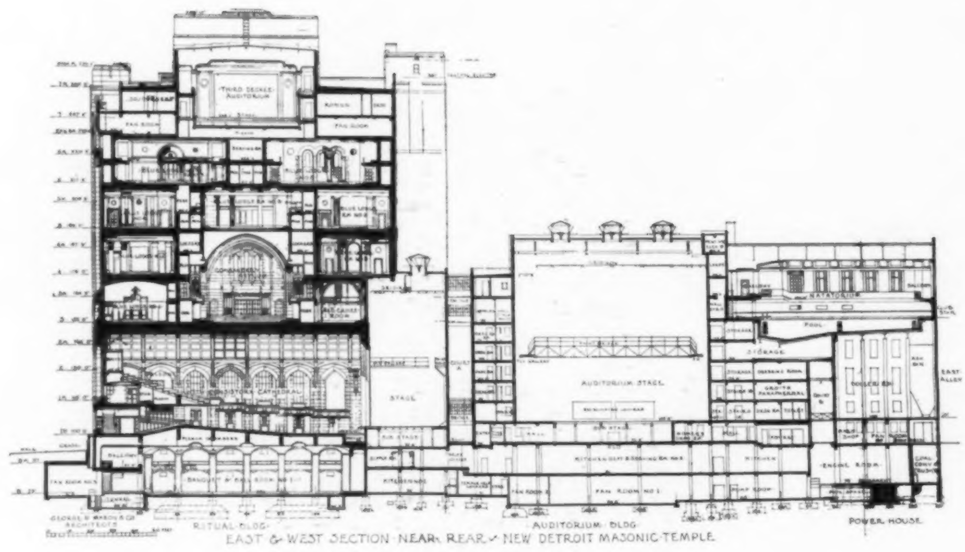
GEORGE D. MASON & CO., ARCHITECTS


ONE OF THE LODGE ROOMS

*Section on Back*

ROMANESQUE LODGE ROOM, DETROIT MASONIC TEMPLE

GEORGE D. MASON & CO., ARCHITECTS




EAST AND WEST SECTION, DETROIT MASONIC TEMPLE

GEORGE D. MASON & CO., ARCHITECTS

# THE BARBIZON

BY

MATLACK PRICE

MURGATROYD & OGDEN, ARCHITECTS

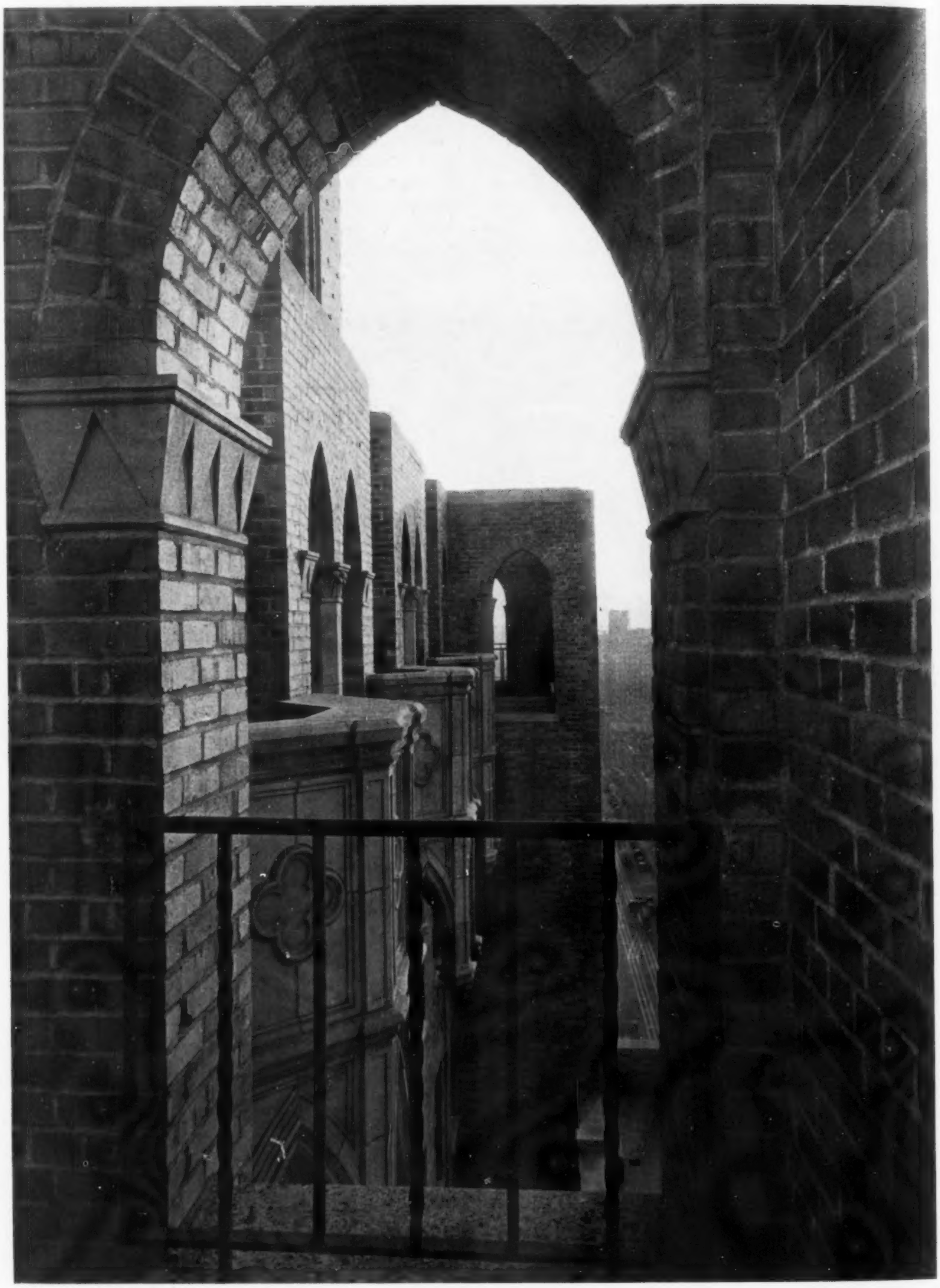
MIDTOWN New York is now so definitely a geographical location, and its vast building activity is spreading so rapidly that we may soon find it necessary to locate a given building in upper or lower midtown. Thus, with 42nd Street as the center, 63rd Street might represent at least the fringe of upper midtown New York, where at Lexington Avenue, is The Barbizon, a new towering club-hotel designed by Murgatroyd & Ogden. Its difference, socially, from hotels in general will be taken up later. Our primary interest, in any case, has to do with the architectural aspect of The Barbizon.

Seen from any point of view, it piles up well; its masses are vigorously and competently handled. The effect of four massive square towers at the corners, running well up the great central block of the building, gives the same strong, effective, vertical shadows that make The Shelton, farther down Lexington Avenue, one of the best buildings of its kind that our new architecture has achieved. The manner of The Barbizon, however, is a little different. Though The Shelton is Romanesque in detail, its total effect is that of an unusually rugged sort of mediævalism; and though The Barbizon is mainly Gothic in detail, its total effect is of a very Romanesque sort of Gothic. The utilization of large Gothic windows is ingenious as applied to this type of building, not only scaling well with the great masses and heights involved, but lending as well some feeling that might be called romantic,—romantic, certainly, as opposed to the mechanistic effect which some have seen as a possible æsthetic danger in the new architecture. The detail of The Barbizon has been managed economically yet adequately. Where incident was needed, it was provided, and with a simplicity of manner and an accuracy of scale revealing a careful and intelligent study of the whole project. In color and technique the brickwork is pleasing,—a range of salmon to light red, laid up with considerable diversity and trimmed with a neutral-toned limestone,—in all, a definitely worthwhile contribution to the number of great new towers which now distinguish midtown New York.

The Barbizon, New York
Murgatroyd & Ogden, Architects

As a "club residence for business and professional women and students of art, drama and music," one anticipates some expression of this within, some expression of the atmosphere of such a place,—and one finds that this has been secured in terms of excellent good taste. The only effect that could be called at all elaborate, (and it is not at all overdone) is the Italianate treatment of the lobby and mezzanine,—the kind of transitional Gothic-to-Renaissance that came to France from Italy in the period of Francis I. Yet there is a quiet restraint in the handling of it here, in a manner befitting the entrance of an important building. From the northwest corner of the mezzanine, two steps lead down into a pleasant library, done with charm and simplicity. The dining room, which opens from the main floor of the lobby, is done in an Adam treatment and proportioned and scaled, one would say, to provide quiet and intimacy for the guests rather than to inspire the "delusions of grandeur" that constitute the chief attraction of those hotel dining rooms that are carried out "in the grand manner." A large solarium or lounge, furnished in admirable taste, is located on the west side of the nineteenth floor, and above this there are attractive rooms for a number of the college clubs.

A study of The Barbizon cannot but remind one of the extraordinary advance in good taste represented today by buildings of its type. Architectural design *per se*, a more intelligent use of materials, ever-increasing efficiency in fixtures and equipment, quiet good taste in furnishings,—all contribute to the creation of a new type. It is seen not only in the newest hotels and apartment houses, but in office buildings, and even in railroad stations. Unlike the Bourbons, who have been said to "learn nothing and forget nothing," architects have learned a vast amount, even during the past ten years, and have forgotten, happily, much that merely cluttered up buildings and made against good taste and utility alike. The Barbizon seems to give evidence of a new understanding of civilization, wholly convincing



*Photos. S. H. Gottscho*

ROOF GARDEN ARCADE, THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS

ARCHES AND BALCONIES, EIGHTEENTH FLOOR, THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS

ROOF GARDEN WALK

BALCONY LOUNGE

THE BARBIZON, NEW YORK

MURGATROYD & OGDEN, ARCHITECTS

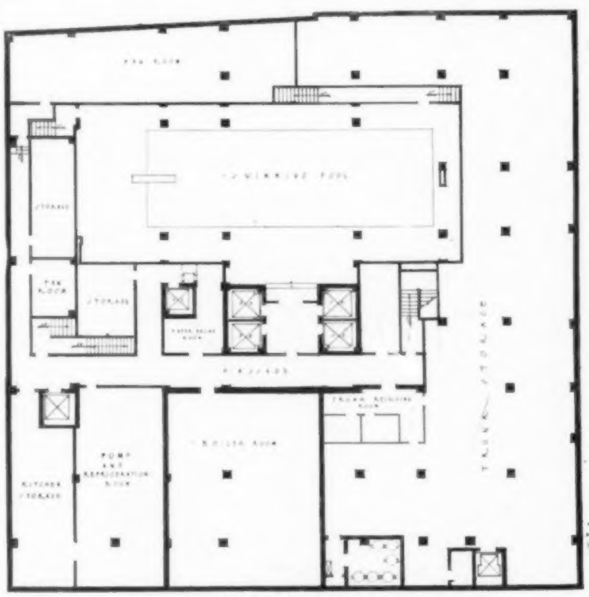
Photos. S. H. Gottscho

Plans on Back

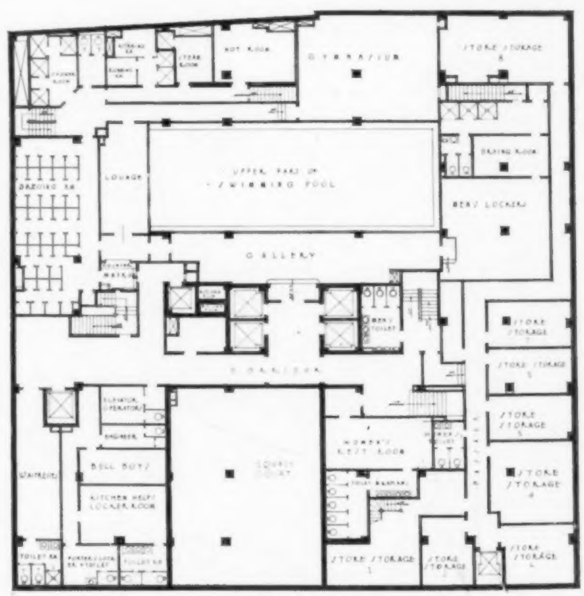
THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS


FIRST FLOOR

SECOND FLOOR



SUB-BASEMENT



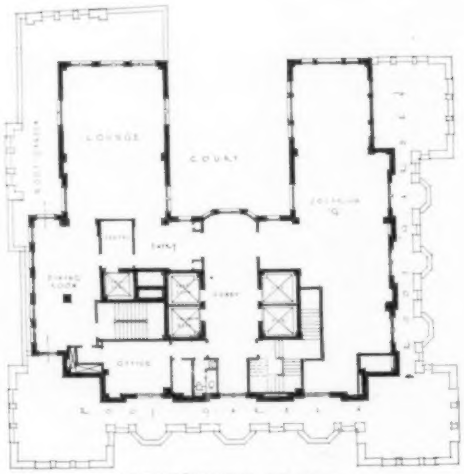

BASEMENT

PLANS, THE BARBIZON, NEW YORK

MURGATROYD & OGDEN, ARCHITECTS

*Plans on Back*

DETAIL OF LOWER STORIES
THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS



EIGHTEENTH FLOOR

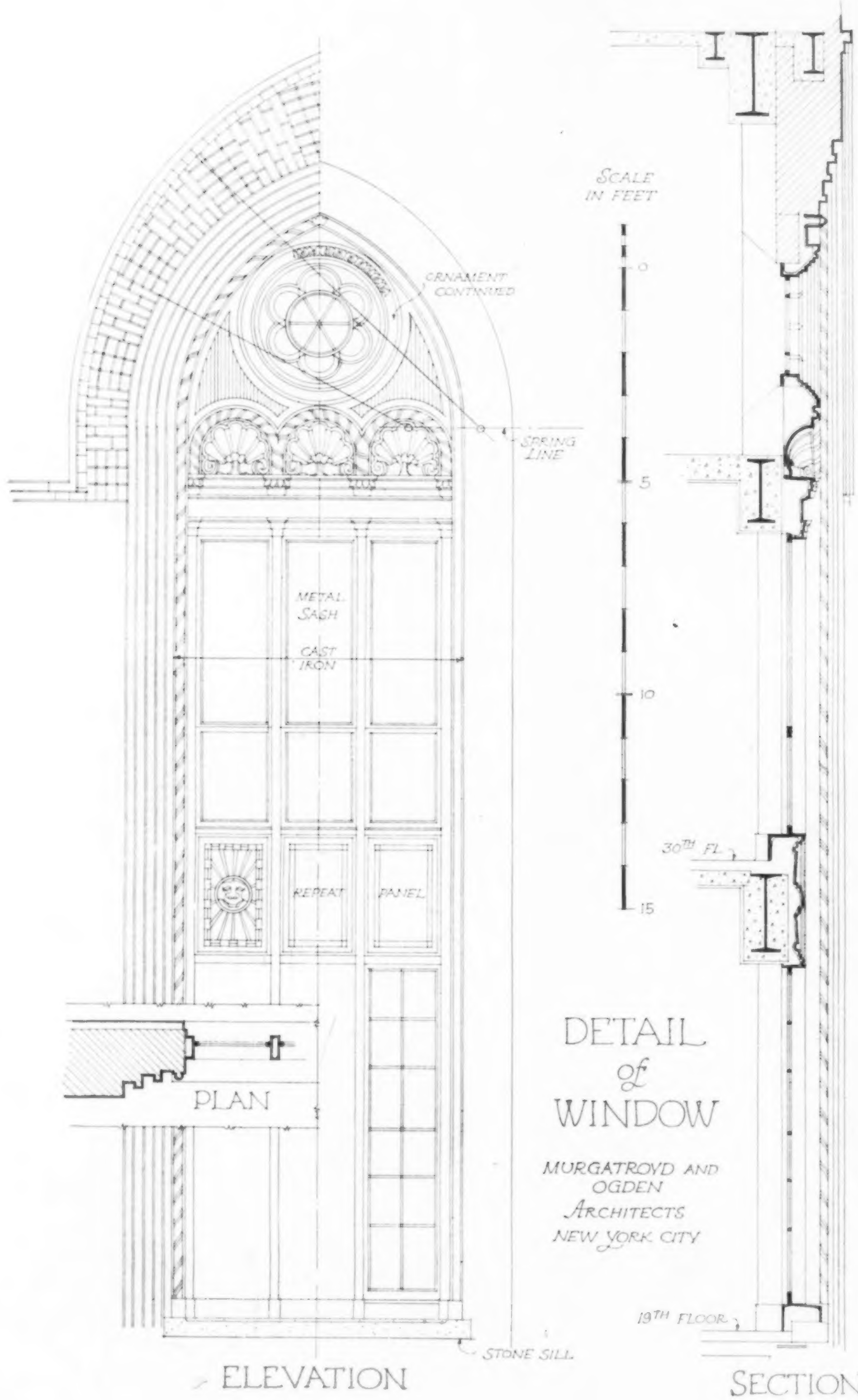
TWENTIETH FLOOR

PLANS, THE BARBIZON, NEW YORK

MURGATROYD & OGDEN, ARCHITECTS

Detail on Back

DETAIL OF UPPER STORIES
THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS



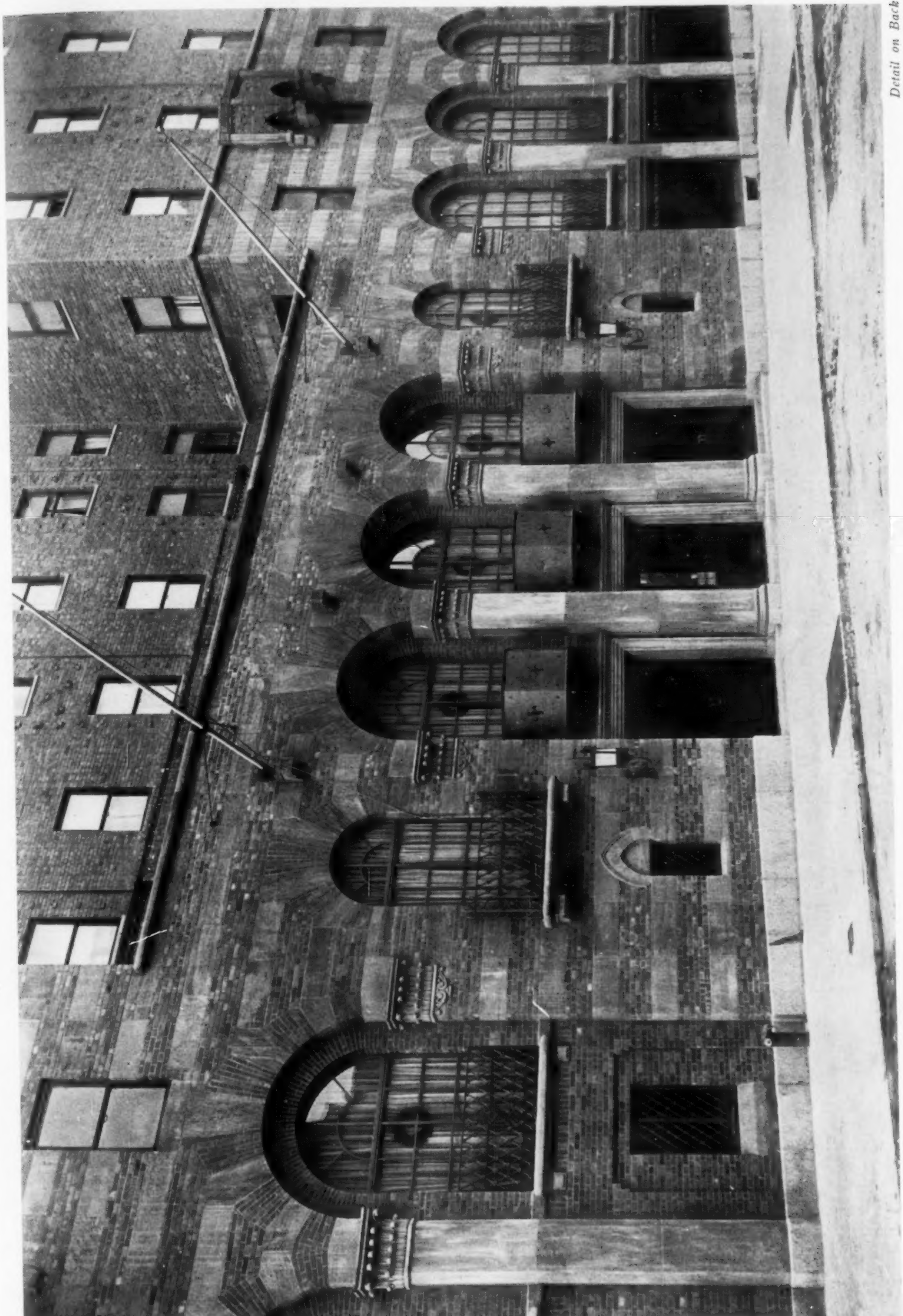

DETAIL of WINDOW

MURGATROYD AND OGDEN
Architects
NEW YORK CITY

MAY 1928

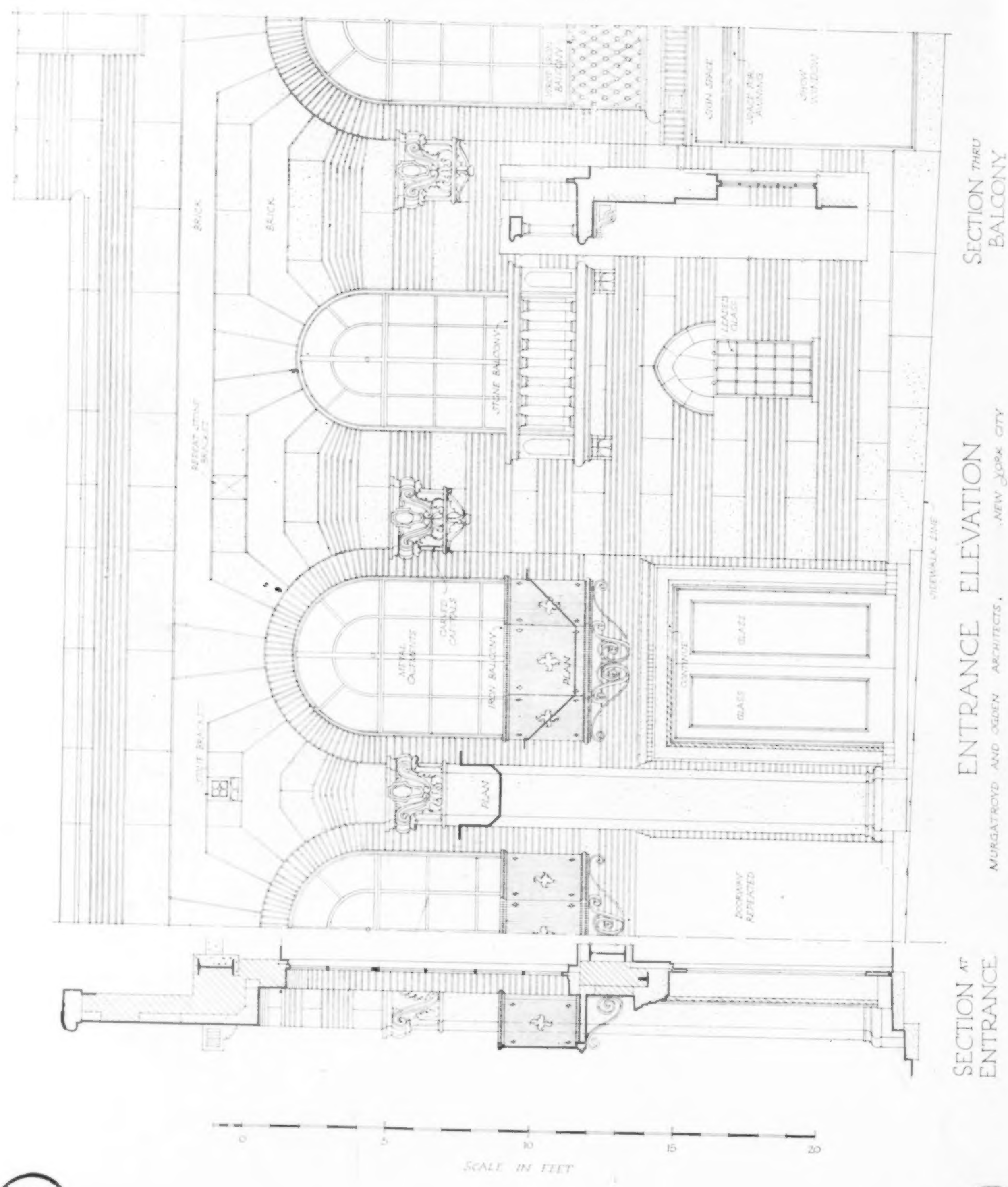
No. 71

The Architectural Forum Details



Detail on Back

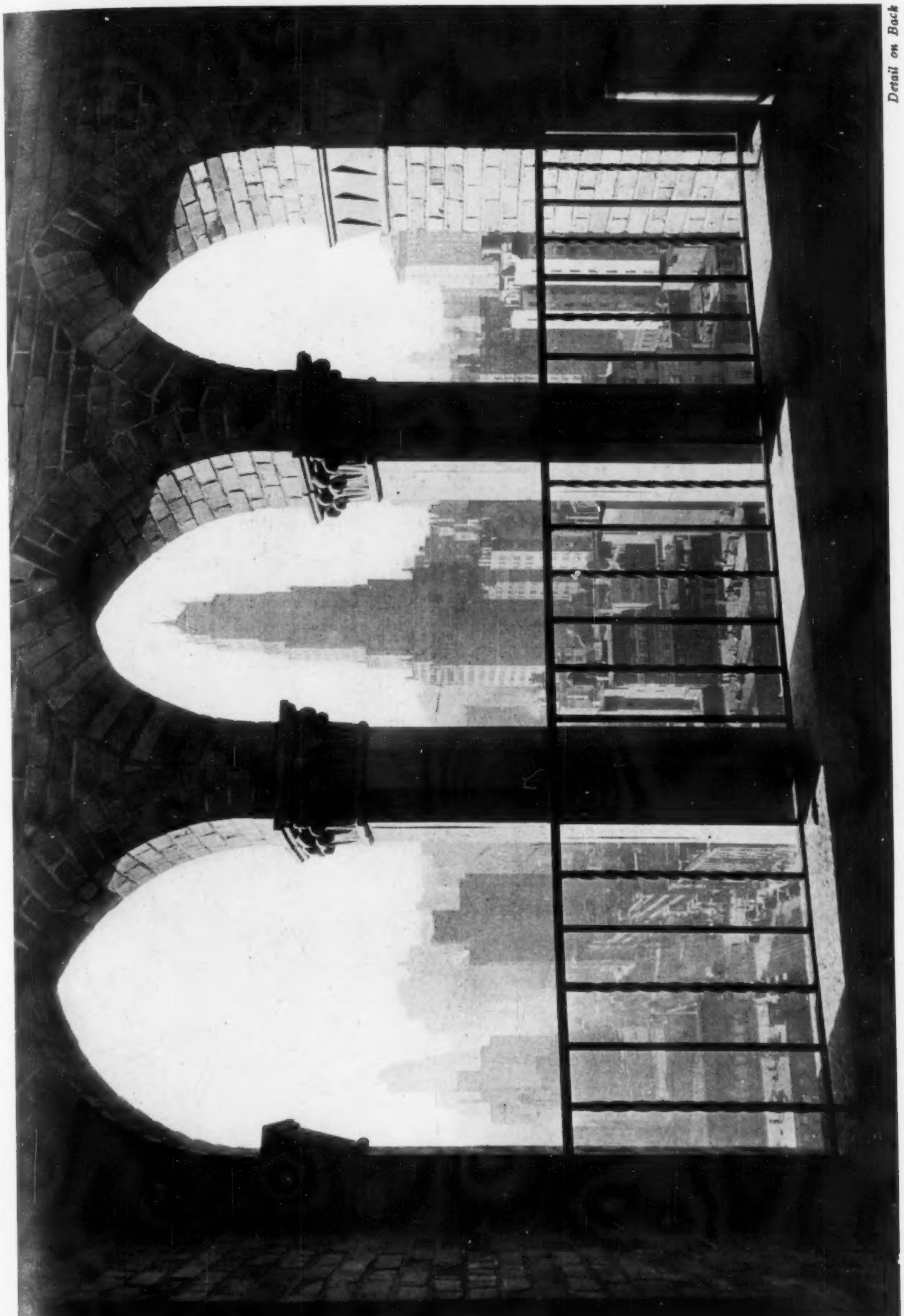
MAIN ENTRANCE
THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS




MAY 1928

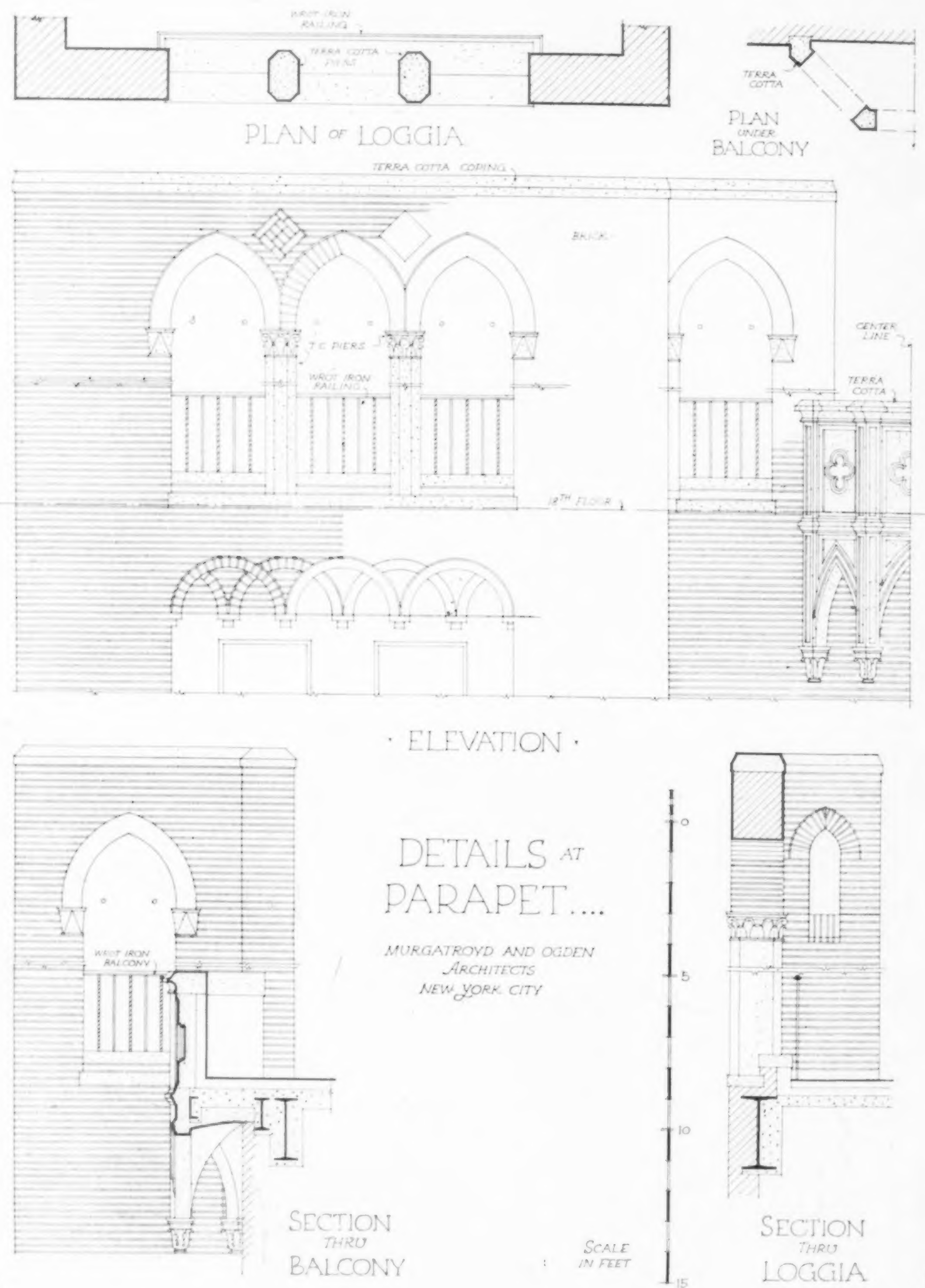
No. 72

# The Architectural Forum Details



*Detail on Back*

LOGGIA ON THE EIGHTEENTH FLOOR
THE BARBIZON, NEW YORK
MURGATROYD & OGDEN, ARCHITECTS




MAY 1928

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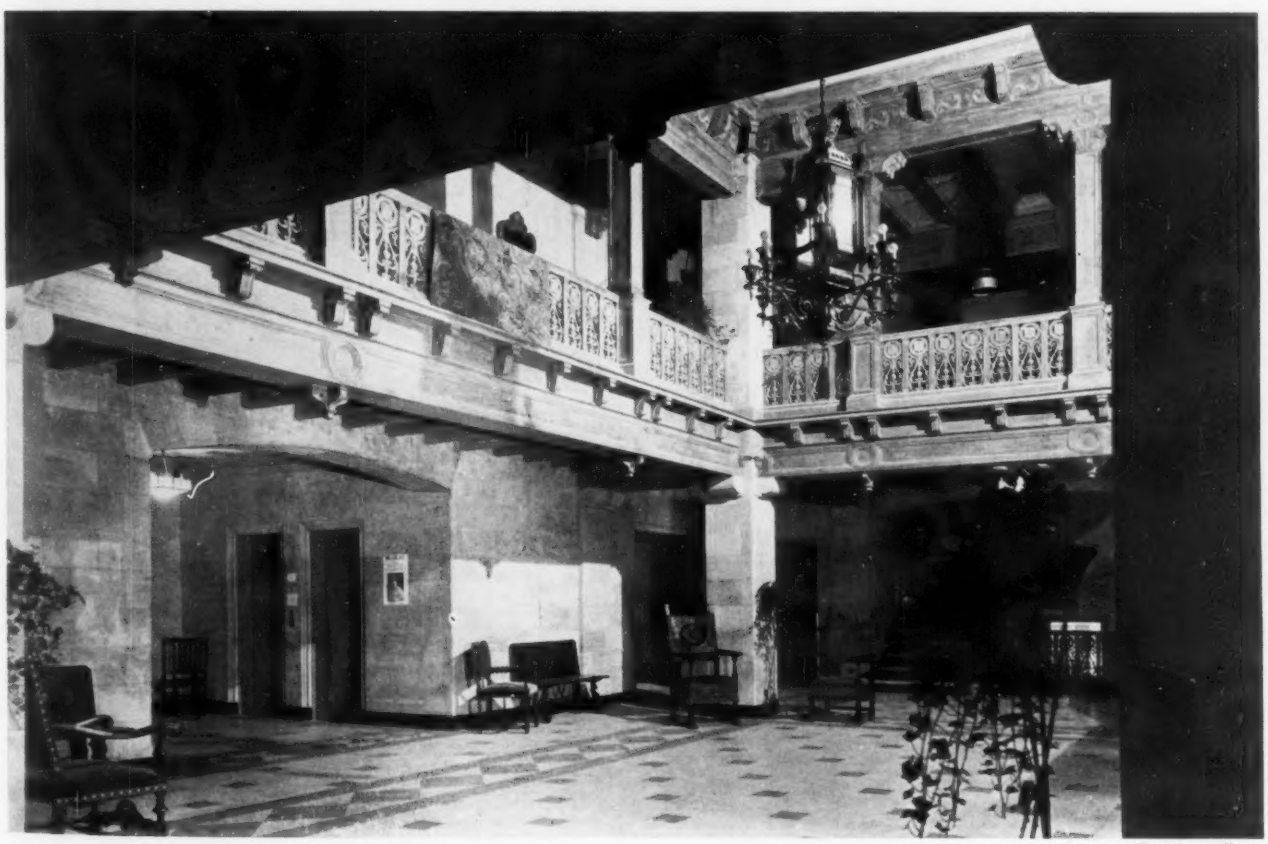
# The ARCHITECTURAL FORUM DETAILS

LOUNGE AND EXHIBITION ROOM

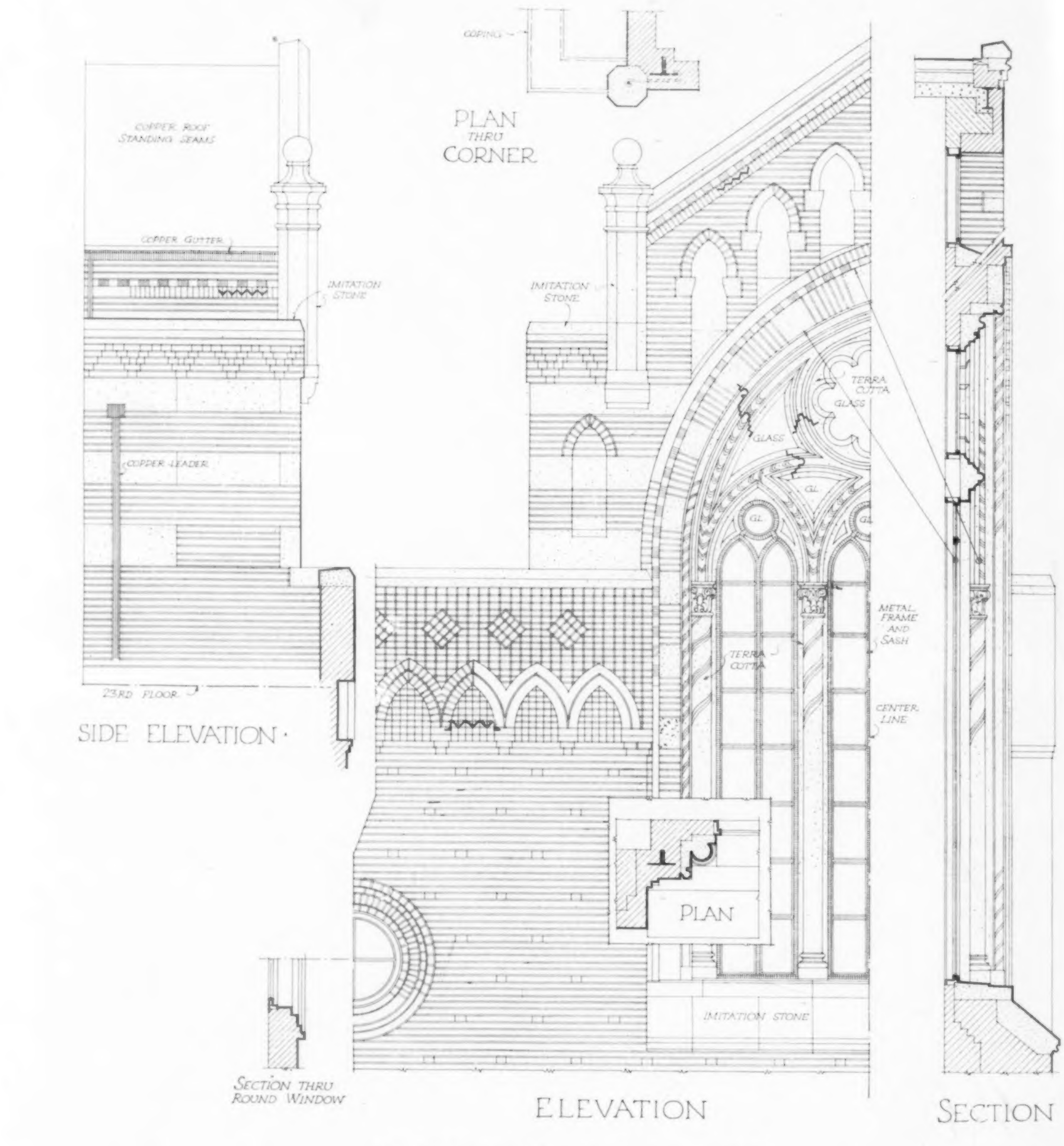


Detail on Back

MAIN LOBBY

THE BARBIZON, NEW YORK

MURGATROYD & OGDEN, ARCHITECTS

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MURGATROYD AND OGDEN ARCHITECTS, NEW YORK CITY

SCALE IN FEET

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MAY 1928

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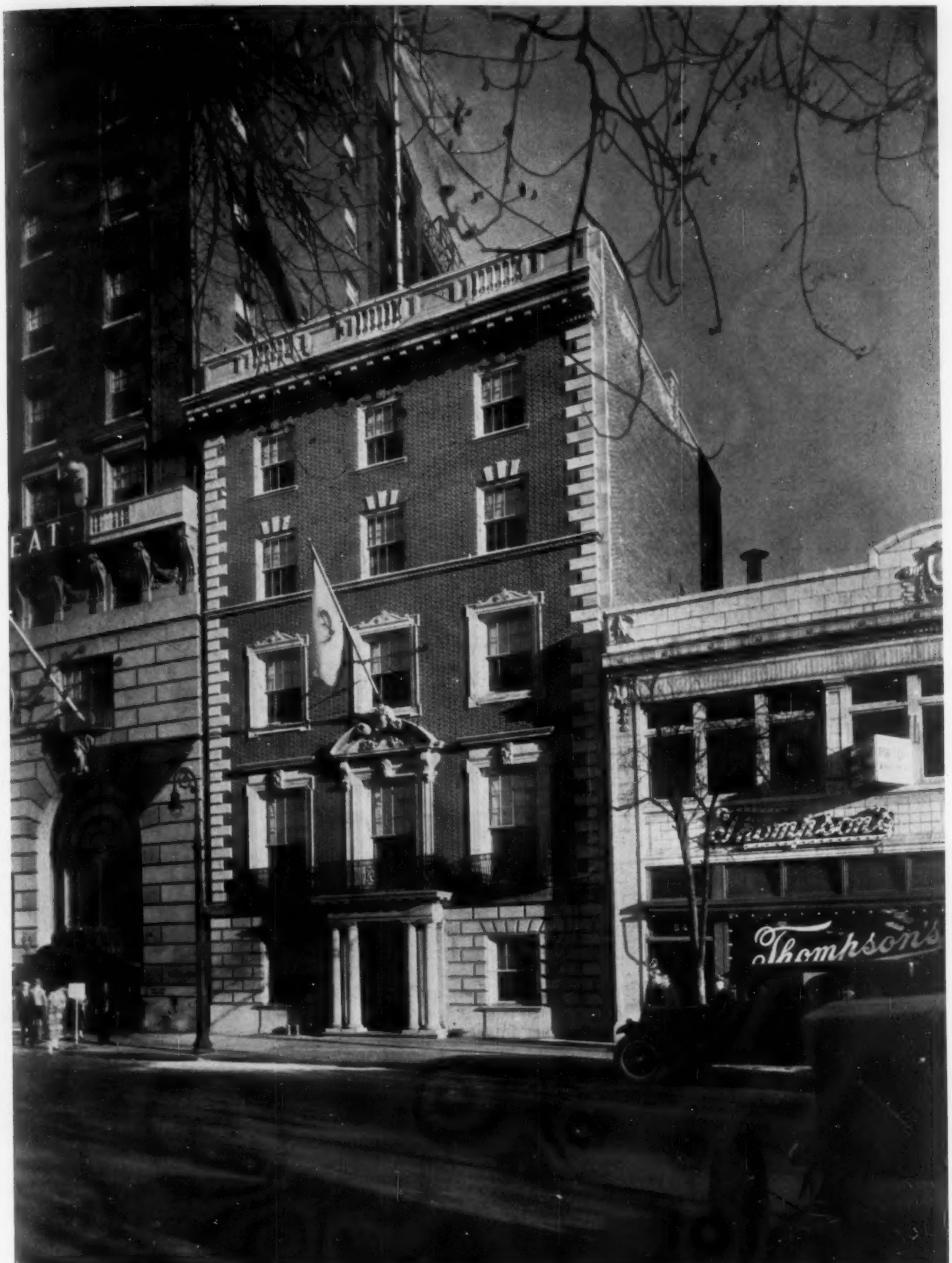
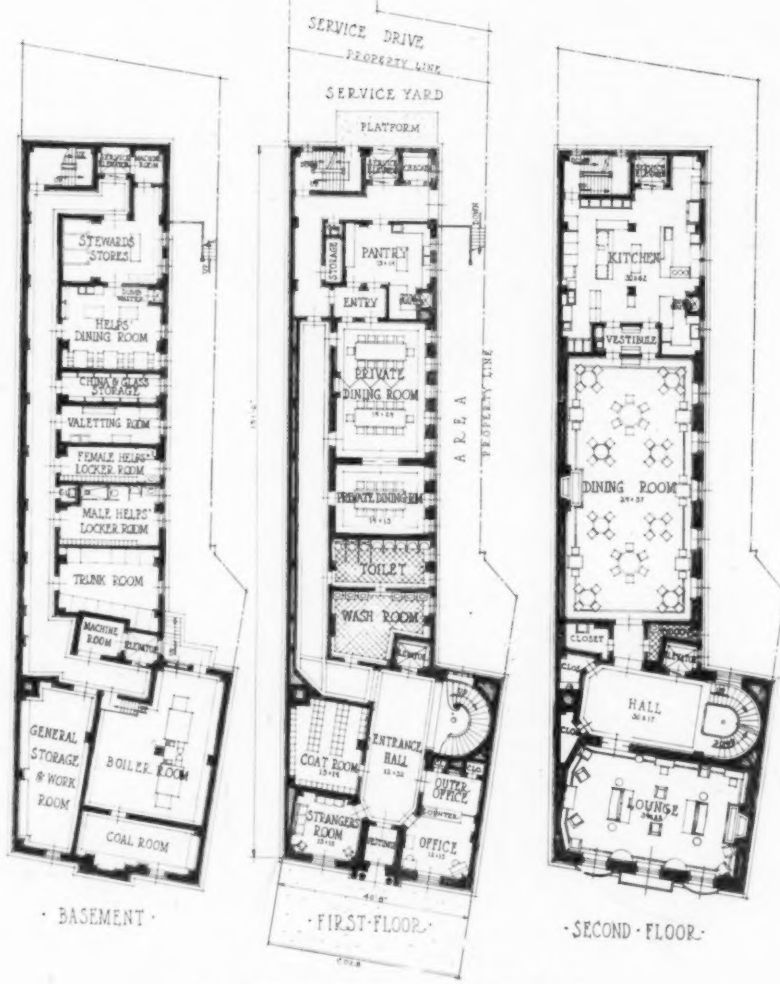



Photos. John Wallace Gillies, Inc.

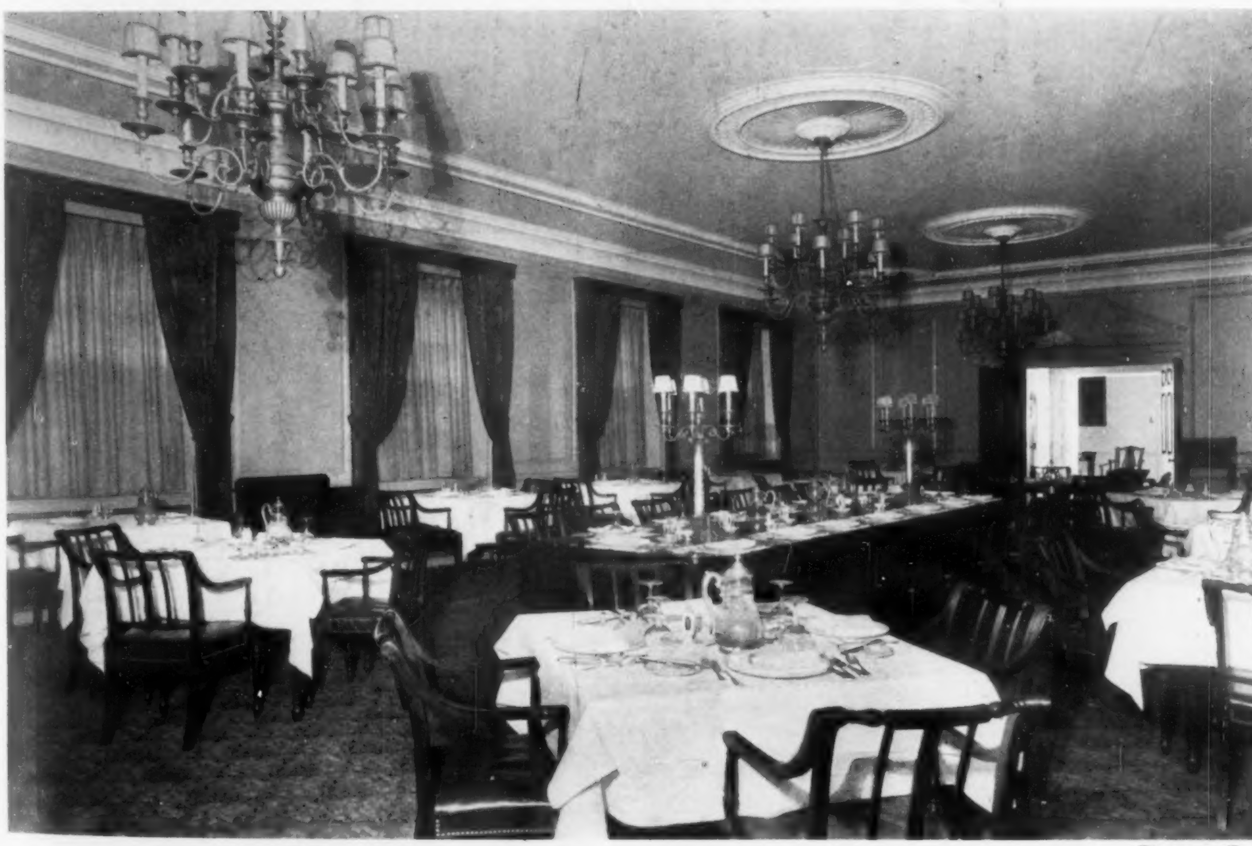
Plans on Back

ESSEX CLUB, NEWARK
GUILBERT & BETELLE, ARCHITECTS



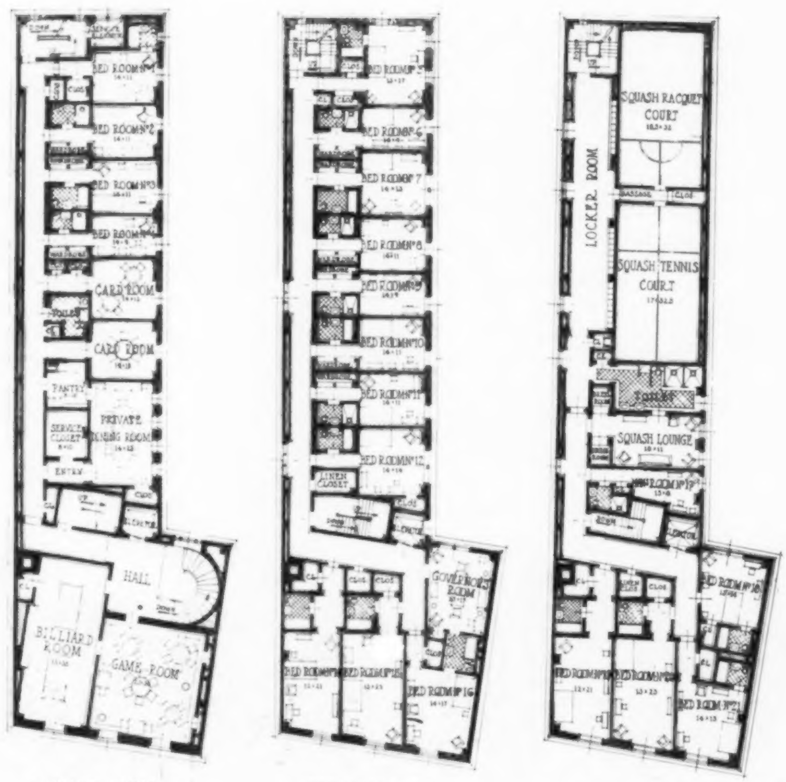

PLANS, ESSEX CLUB, NEWARK
GUILBERT & BETELLE, ARCHITECTS

THE LOUNGE



Plans on Back

MAIN DINING ROOM
ESSEX CLUB, NEWARK
GUILBERT & BETELLE, ARCHITECTS




· THIRD FLOOR · · FOURTH FLOOR · · FIFTH FLOOR ·

PLANS, ESSEX CLUB, NEWARK
GUILBERT & BETELLE, ARCHITECTS

# PHI DELTA THETA FRATERNITY HOUSE UNIVERSITY OF VERMONT

BY

WILLIAM McLEISH DUNBAR, ARCHITECT

THE pleasant dinner may be—much food and little speaking, the successful game—many plays and little argument, the enjoyable article—many pictures and little writing. If so, this presentation of Vermont Alpha's new house is doomed. The architect has been asked to describe it. He would like to make a matter-of-fact statement that it contains 25 rooms, all of course arranged in the most practical manner of construction in the most economical fashion, but he feels that the important feature of the new house is not to be found within its own walls, but that it comes, rather, from the atmosphere of the beautiful town and country which are spread about it.

Burlington, in Vermont, should be known rather than seen, yet outwardly it could scarcely be a more appealing place, overlooking Lake Champlain, with stately mountain ranges on each side,—the Adirondacks and the Green Mountains,—and over all the glittering northern air and sunlight. One feels in Burlington the beauty of its long New England history. It bears the marks of early war and of early peace and culture. It has the battery of queer, ancient guns; the University whose cornerstone was laid by Lafayette; and its elmed streets of fine old houses. When Edward Everett Hale visited the place he said: "Those of you who have been in Burlington will know that I was in a city of palaces." But everything typical in Burlington has the simplicity, dignity and integrity of Vermont, qualities well symbolized by the marble and granite for which the state is famous. These "palaces" of Dr Hale's were the old homes built during the first half of the nineteenth century by the prosperous New Englanders who were the product of the old town. Like all buildings of real architecture, these homes were typical of their owners. They were built in the mannered dignity of the Greek Revival, a style eloquent of simplicity, dignity and classic culture. From the subtlety of this period come beauty and attraction even beyond the appeal of the more obvious styles which more often command attention. Such, then, is the atmosphere of the locality in which a twentieth century fraternity wished to build a chapter house, a structure to accord with its surroundings.

The committee which directed the building of the house at the University of Vermont from the beginning had in mind a simple, substantial house rather than one more spectacular. They were also desirous of following a further propriety; wherever possible they wished to use native materials and articles of local craftsmanship. So it is that the exterior walls are constructed of beautiful crystalline marble, which was freighted to Burlington from the Vermont quarries at Proctor. This stone is bril-

Entrance Front, Phi Delta Theta Fraternity House, Burlington, Vt.

DINING ROOM
PHI DELTA THETA FRATERNITY HOUSE, BURLINGTON, VT.
WILLIAM McLEISH DUNBAR, ARCHITECT

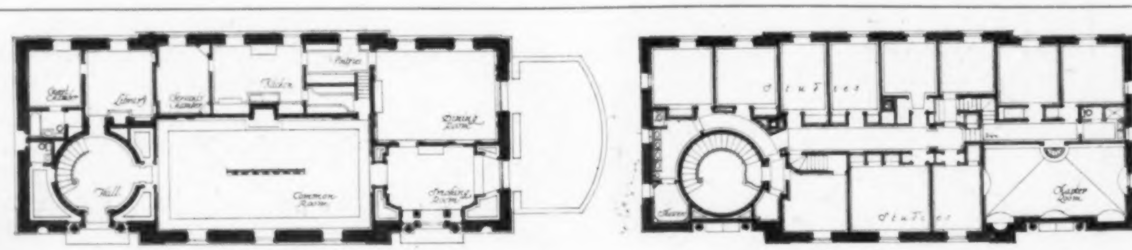
SMOKING ROOM
PHI DELTA THETA FRATERNITY HOUSE, BURLINGTON, VT.
WILLIAM McLEISH DUNBAR, ARCHITECT

Niche in Chapter Room

Library Chimneypiece

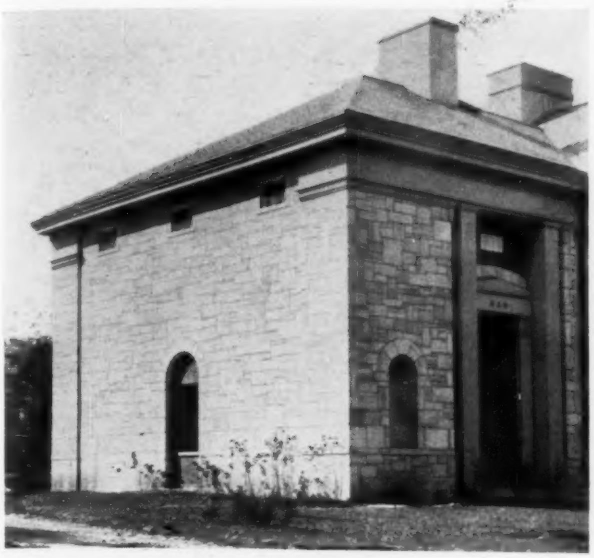
liantly white in the sun, but is relieved from glare by a delicate veining of green. The blocks are laid in the wall in an irregular bond and with joints of varying widths, so that there is not an impression of too great formality. It is often amusing to use an exquisite material carelessly. For trimming, white marble was used with a sanded surface, and in certain places it was carved in Greek design. The roof is of Vermont green slate, and together with the window blinds and white walls it carries out the old fashioned color scheme of green and white.

The site is at the head of College Street, which makes a gradual ascent of 300 feet from Lake Champlain to the University .Under the continuous arch of lofty elms, there is almost the air of a dim cathedral nave. The new house stands slightly above the curb level, facing north. Because of this orientation most of the windows were put at the rear, and those rooms which do not require sunlight were placed fronting the street. In the center portion is the music room; in the wings, the two-storied entrance hall and the domed chapter room, both lighted from above. This arrangement makes possible the use of very large doors and windows, which increases the effect of simplicity, but, however, makes the house look smaller in the accompanying illustrations than it really is. Although not actually large, an indication of its size may be had



First Floor Second Floor

Phi Delta Theta Fraternity House, Burlington, Vt.
William McLeish Dunbar, Architect


Entrance at the East End


Terrace at the West End

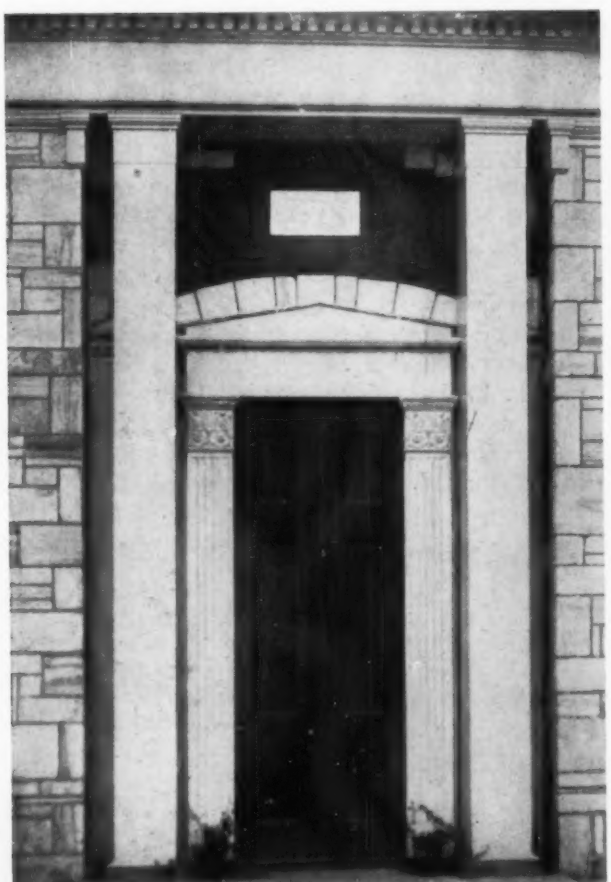
from the lower windows and door, which are 12 feet high. A further individuality is due to the unusual material. Aside from the federal building, there are no marble structures in Burlington. The entrance door is in the east wing and bears above it a tablet inscribed "1848." The tall leaves of the outer door are pivoted and fold back into the thickness of the wall without showing unsightly hinges. The hall is a circular, severely simple room, dimly lighted by a high skylight. The solidity of the building is noticeable here. The walls and conical ceiling are gray plaster, the self-supporting stairway is of marble of a warm tan color, and the floor is rough tile of the same shade. The border around the base of the wall and up the stairs is of blue faience. The moulded door casings are painted white, and the openings are filled with quaint blinds. The principal feature of the hall is the stair rail, which rises in an unbroken spiral. It was wrought by hand, the work of an old time craftsman. At the left of the hall are coatroom and lavatory, and directly beyond is the library. The finish of this room is of wide planks of varying widths laid horizontally on the walls from floor to ceiling, being a less formal treatment than wood paneling. The walls are painted an antique green, and the mouldings, trim and cornice are dull carmine. The high ceiling is old gold. All these colors tone together in such a way as to form a restful background enlivened only by the curtains and chair covers of gay English chintz. The chimneypiece is also of English origin, at it was taken from an old London house. Its carving has the charm for which the eighteenth century craftsmen are noted. A secret door leads from this library to the guest bedroom, beyond which is a tiled bath. The entrance to the large room of the house is also from the circular hall. Here also the paneled doors fold back on each side, giving the impression of there being a very thick wall. This room is a general lounge. Its dimensions are 44 feet by 22 feet. The walls and ceiling are gray plaster with a classic cornice in pure white. At the base of the wall is a mosaic dado in a Greek pattern in black, gray and blue. The principal decorations of this room are the long curtains patterned in a Directoire design in blue, gray and apricot. The floor is left bare of rugs and is of selected Vermont birch divided into squares by inlays of black wood. As yet the fireplace wall is undecorated. A specially modeled plaque of the fraternity's goddess from the classic model, "the


Card Room in Basement

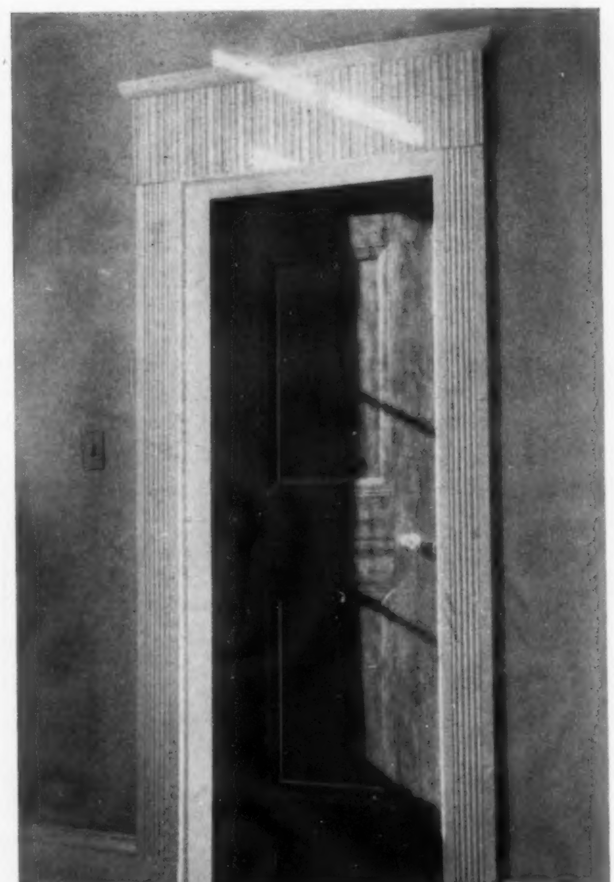

Card Room Fireplace

WINDOW IN SMOKING ROOM

DOOR IN COMMON ROOM



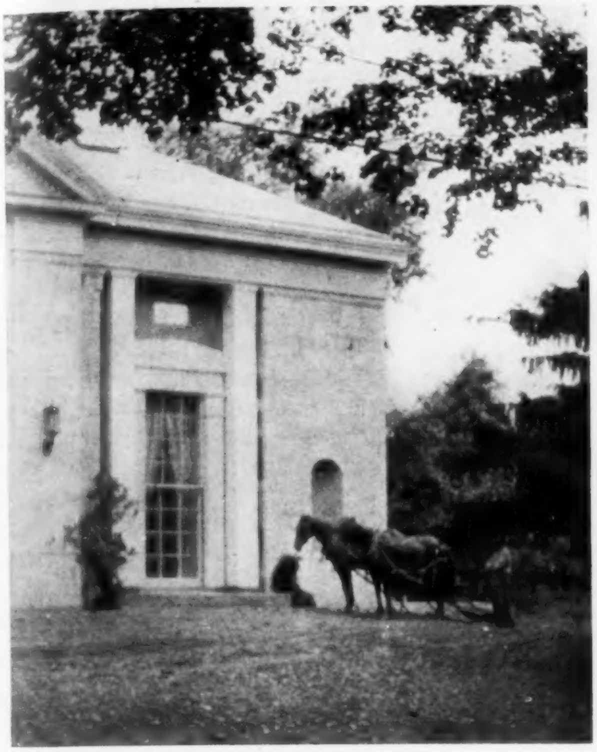
THE ENTRANCE



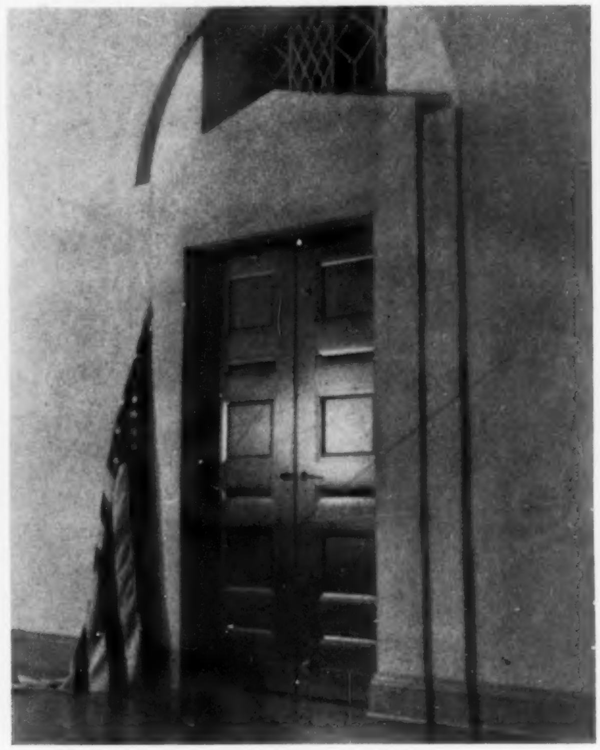
A TYPICAL DOORWAY

PHI DELTA THETA FRATERNITY HOUSE, BURLINGTON, VT.

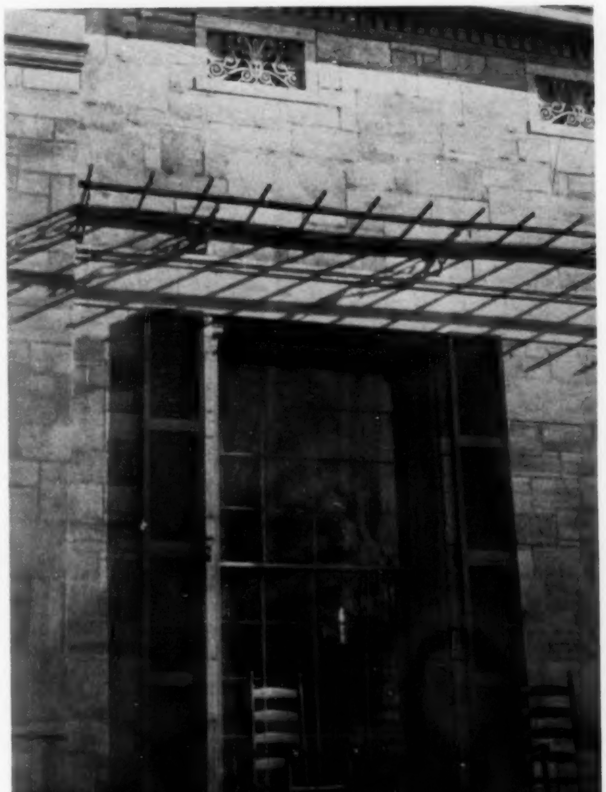
WILLIAM McLEISH DUNBAR, ARCHITECT



SMOKING ROOM WINDOW



CHAPTER ROOM DOOR



TERRACE WINDOW

CIRCULAR STAIRS

PHI DELTA THETA FRATERNITY HOUSE, BURLINGTON, VT.

WILLIAM McLEISH DUNBAR, ARCHITECT

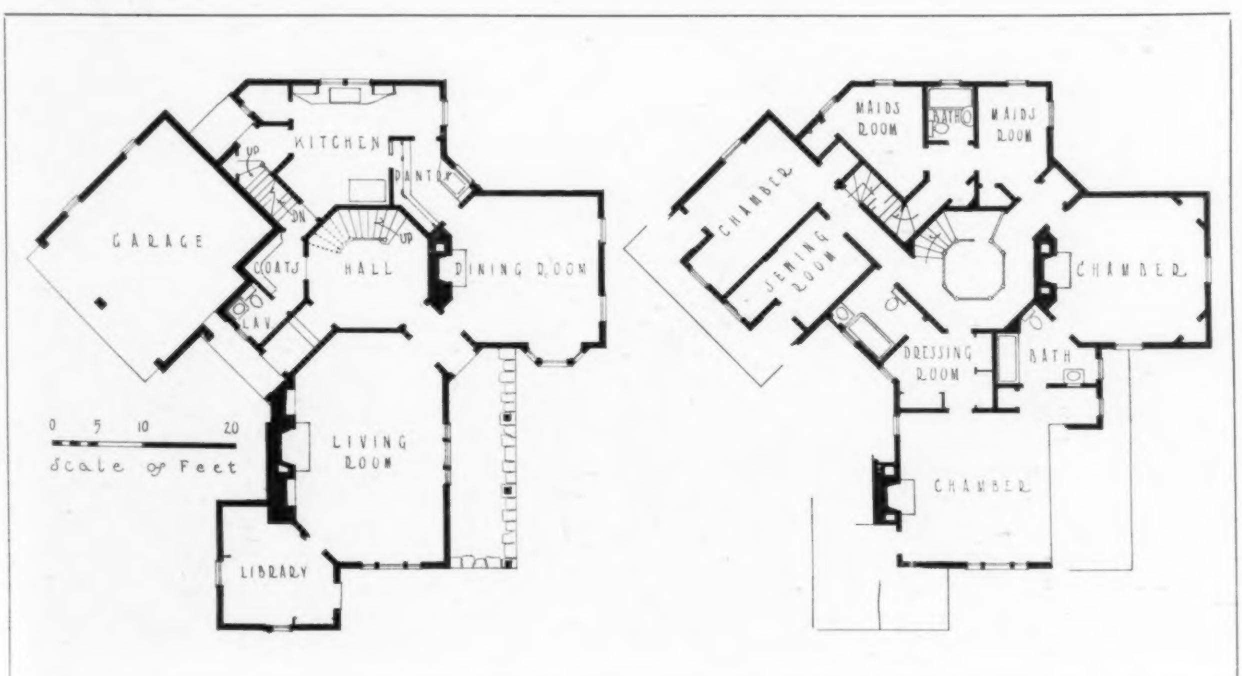
Pensive Athene," is to be set into the wall and bordered by scarlet and gold tiles, and the whole wall decorated by hand after the manner of the Directoire period. Beyond the large room or lounge is the smoking room with the house manager's office and filing closet adjoining. Next and at the rear, overlooking lawn and tennis court, is the dining room. This is a high-ceilinged room modeled after an old hall at Harvard. The planked walls are painted pale green and are relieved by fluted wood pilasters painted antique white. The huge windows are curtained in a violet colored material, and the specially designed furniture is the golden color of old maple. Twenty men eat at one long table, and there are additional tables which may be joined to this to make an H-shape. The service department is at the rear. The most obviously attractive room is the card room in the basement. Here it was decided to leave subtlety behind and make a "rough house" room. The walls are crudely half-timbered, with the rough plaster peeling off in places and so showing the brick beneath. The ceiling is beamed with adzed timbers, these being over a century old. They are a relic from the last chapter house. The fireplace is of rough red sandstone with a high hearth. The floor is cement. The color of the room is rather harsh,—dark brown timbering, cream colored plaster, orange shutters; and the oak doors, 2½ inches thick, are stained in orange, emphasizing the grain of the wood.

Students at the University of Vermont must either have their homes in the state or be descendants of alumni. Consequently the registration is but 1100, and the fraternity chapters are small. On the second floor of the house there are ten studies, each for two men only. There is also a segregated room for the house matron. The hall of this floor is more than a passage in that it is ample and symmetrically arranged, with the room doors set in deep recesses. The studies are designed and furnished as carefully as the rest of the building, for they are the most important element in any fraternity house. These rooms are divided into three sections and are cut off from the main hall, this is to insure quiet. The walls are finished in rough gray plaster of very pleasing texture. The elaborately moulded door casings with their pedimented tops serve as relief to the plain plaster. The doors themselves are of beautifully matched gumwood. Old fashioned box-locks of polished brass are mounted on the faces of the "lockrails." Each man has a wardrobe or dresser, with a conveniently located electric light, all built into the wall and shut off from the study by a door. The desks are modeled after the old fashioned slant-top type, and the study chairs are comfortable Windsors. In addition there are upholstered chairs covered in bright cretonne matching the long window curtains. There are no desk lamps, the lighting being by iron floor lamps with parchment shades. The rugs are of the same material throughout, but of different colors. At each end of the second floor are stairs leading to the dormitory above, and nearby are tiled bathrooms. One of these connects with an octagonal shower room, complétely waterproofed

There is always something particularly appropriate in the use of the Greek Revival type of architecture for a fraternity house, and here use of the type brings the building into close accord with its surroundings,—with other houses of the same general character.

Common Room Chimneypiece, Phi Delta Theta Fraternity House, Burlington, Vt.
William McLeish Dunbar, Architect

HOUSE OF WINTHROP BROWN, ESQ., CAMBRIDGE, MASS.
J. ROBERTSON WARD, ARCHITECT

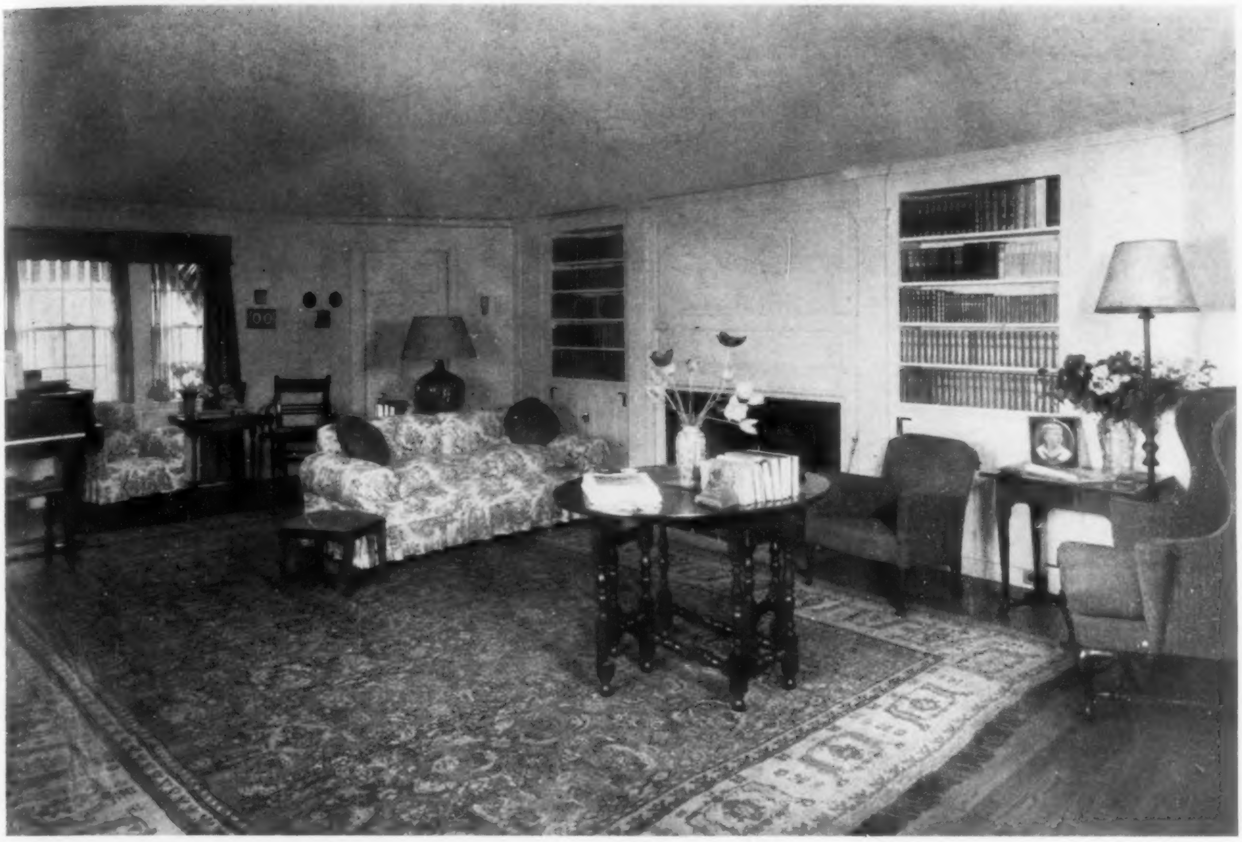



FIRST FLOOR SECOND FLOOR

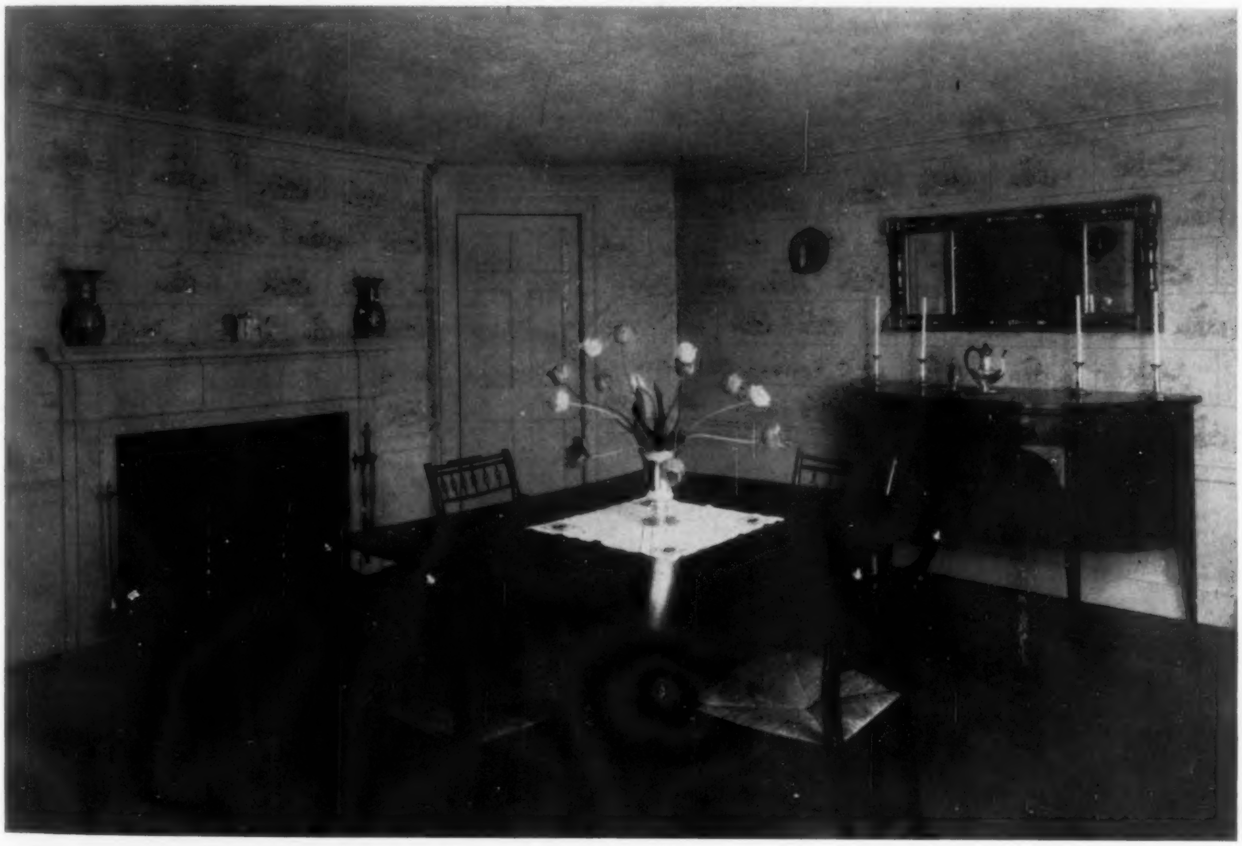
LIVING ROOM END, HOUSE OF WINTHROP BROWN, ESQ., CAMBRIDGE, MASS.
J. ROBERTSON WARD, ARCHITECT

A PLAN more unsymmetrical and ingenious could hardly be imagined. Grouped about a center octagonal stair hall, the various rooms are so placed that they form an irregular Maltese cross. No particular balance or definite arrangement seems to have governed the layout of the plan. One advantage of this peculiar form is that the principal rooms can have windows on three sides, although this opportunity was not taken advantage of, probably for the reason that too many windows cut up wall areas and detract from the sense of privacy and seclusion which the principal rooms in a small country house should always possess. The fact that three of the corners of the living room are cut off adds to rather than detracts from the architectural effect. The paneled chimney breast, devoid of any mantelpiece or shelf, with the built-in book cases on either side, is an attractive and well designed feature of the living room. A little library or office opens off one end of the living room, making a convenient and comfortable place for quiet and privacy. The dining room is considerably smaller than the living room, and with the exception of the small bay window on one side is symmetrical in plan, as the fireplace at the center of one end of the room is balanced by doors on each side. The many angles of this plan produce strange shaped spaces which are occupied by the pantry, coat closet, lavatory, and passageways. The kitchen, which is most irregular in shape, has, however, sufficient floor area to accommodate its requirements. Although the garage is definitely set into one angle of the house, it is reached only through a door opening onto the entrance porch. The octagonal stair hall, which is shown in an accompanying illustration, with its white painted walls and the black painted newels and hand rails, has almost the effect of a modernistic French design. On the second floor there are two good sized master bedrooms, two master baths, a sewing room, small guest room, and two maids' rooms and a bath. Necessarily, these rooms are similar in their irregularity of shape to the rooms on the first floor.

This house, which was completed in 1925, contains about 54,000 cubic feet, costing a little over 46 cents per cubic foot, or approximately $25,000. The roof is covered with ¼-inch green slate, and for the gutters, conductors, and flashing copper was used; 24-inch shingles laid 10 inches to the weather cover the outside walls. All of the floors are of oak, except in the kitchen and baths, where rubber tile was used. Brass pipe was used throughout all the plumbing, and white wood for the trim and paneling.



LIVING ROOM

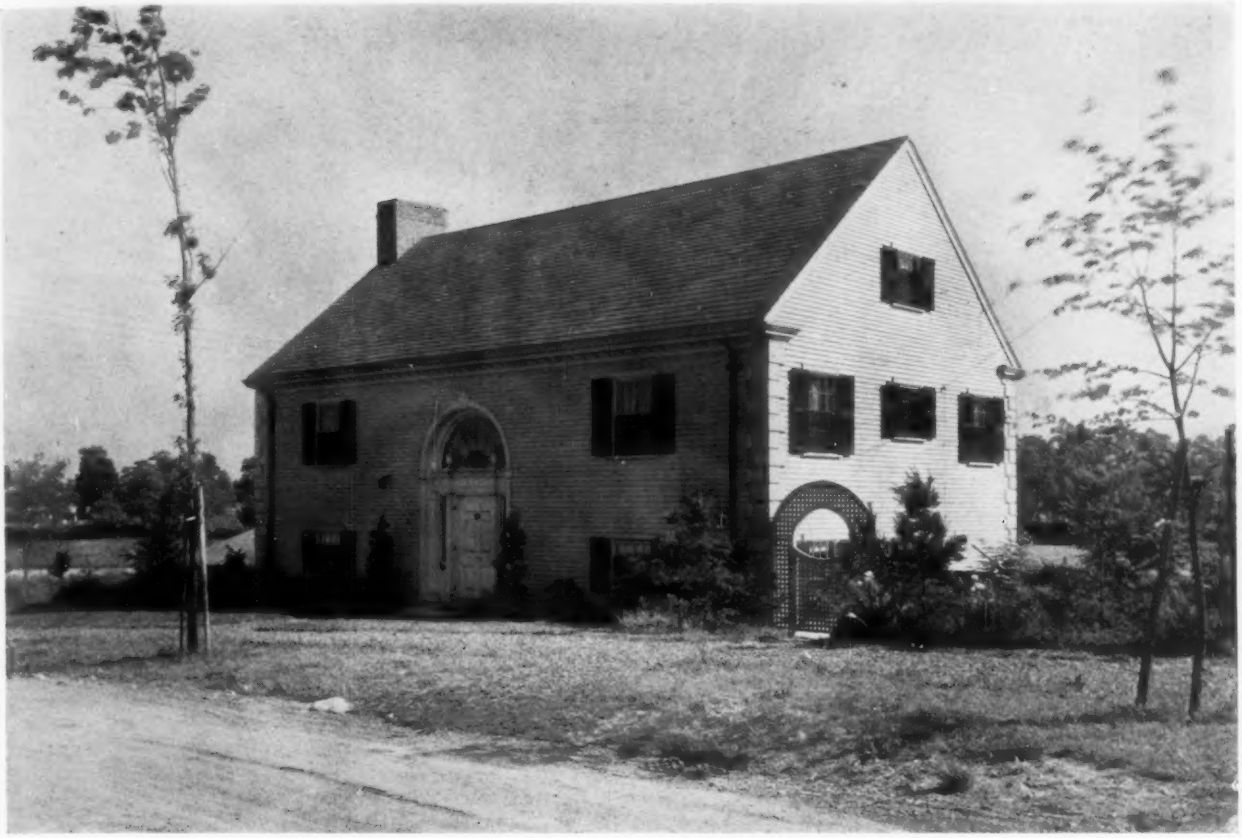


DINING ROOM

HOUSE OF WINTHROP BROWN, ESQ., CAMBRIDGE, MASS.

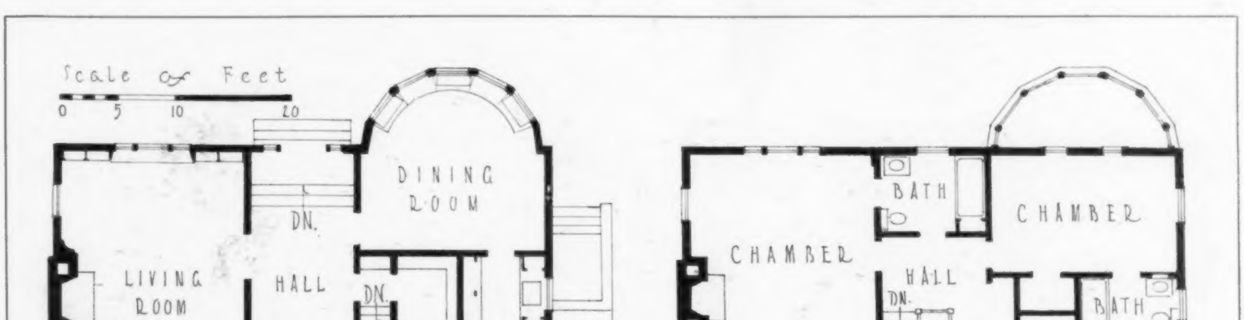
J. ROBERTSON WARD, ARCHITECT

OCTAGONAL STAIR HALL, HOUSE OF WINTHROP BROWN, ESQ., CAMBRIDGE, MASS.
J. ROBERTSON WARD, ARCHITECT

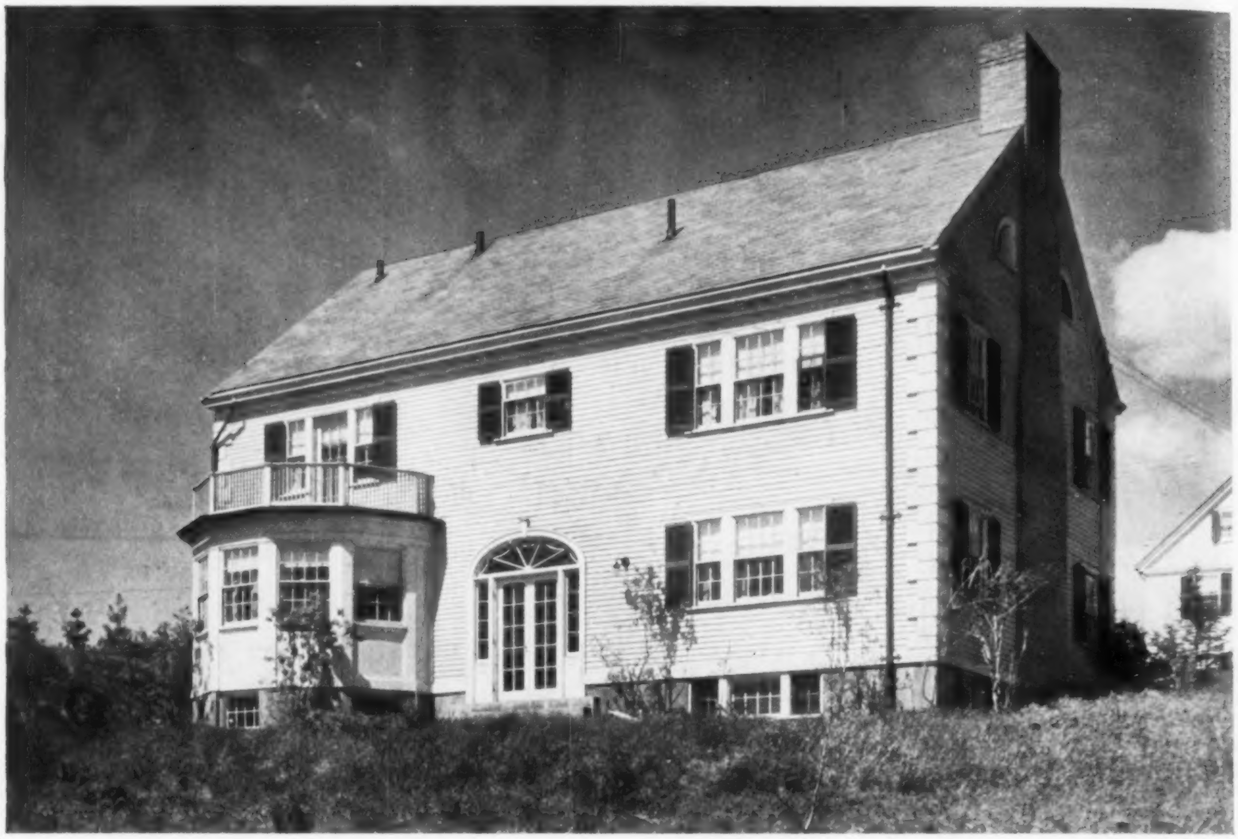


HOUSE OF GEORGE MACOMBER, ESQ., CAMBRIDGE, MASS.
J. ROBERTSON WARD, ARCHITECT

THE chief characteristic of this symmetrical small house is its unusually large and monumental entrance door, which opens upon a landing of the main stairway, midway between the first and second floors. This peculiar location of the entrance door, due to the sharp drop in grade of the lot on which the house is built, makes it possible to keep the front elevation of the house attractively low in height and simple in design. Four well placed windows balance this entrance door at a sufficient distance from it to allow the door to completely dominate the design of the main facade. The rear elevation has a pleasingly homelike quality, due largely to use of the large bay and several grouped windows. The usual wood frame construction was used, wood clapboards for the walls, and ¼-inch green slate for the roof. Containing 38,000 cubic feet at 45 cents, this house cost completed, 1926, about $17,000.




FIRST FLOOR SECOND FLOOR

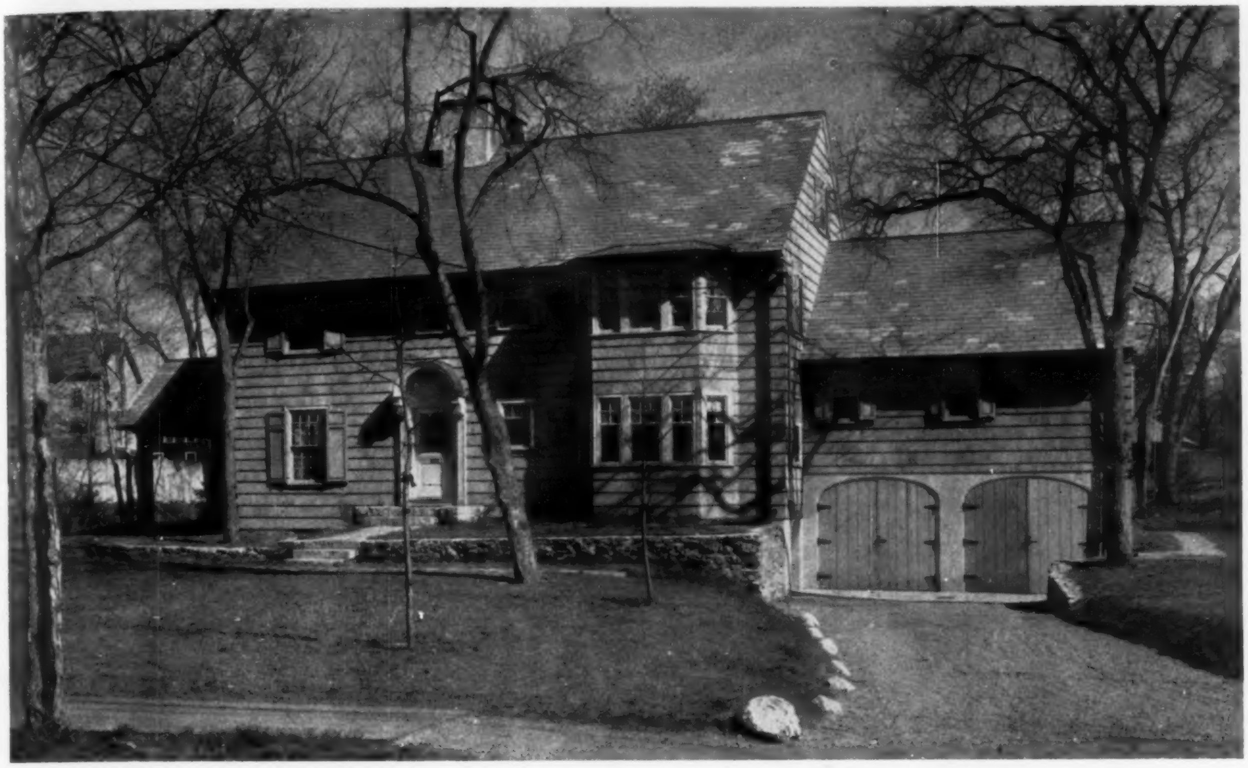


SOUTH ELEVATION

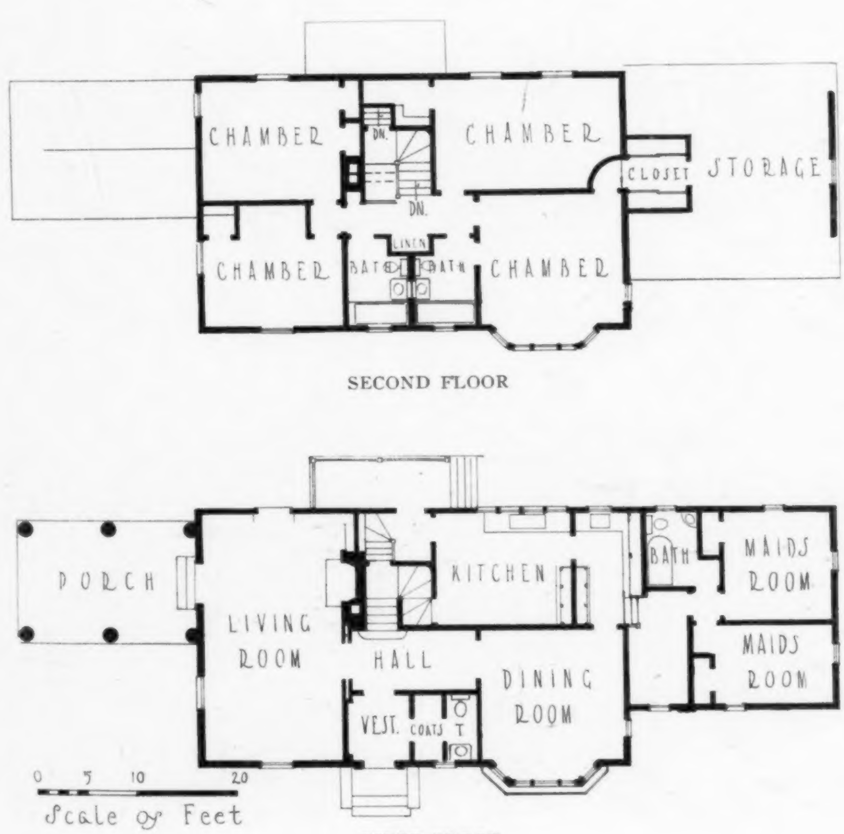
LIVING ROOM

HOUSE OF GEORGE MACOMBER, ESQ., CAMBRIDGE, MASS.

J. ROBERTSON WARD, ARCHITECT



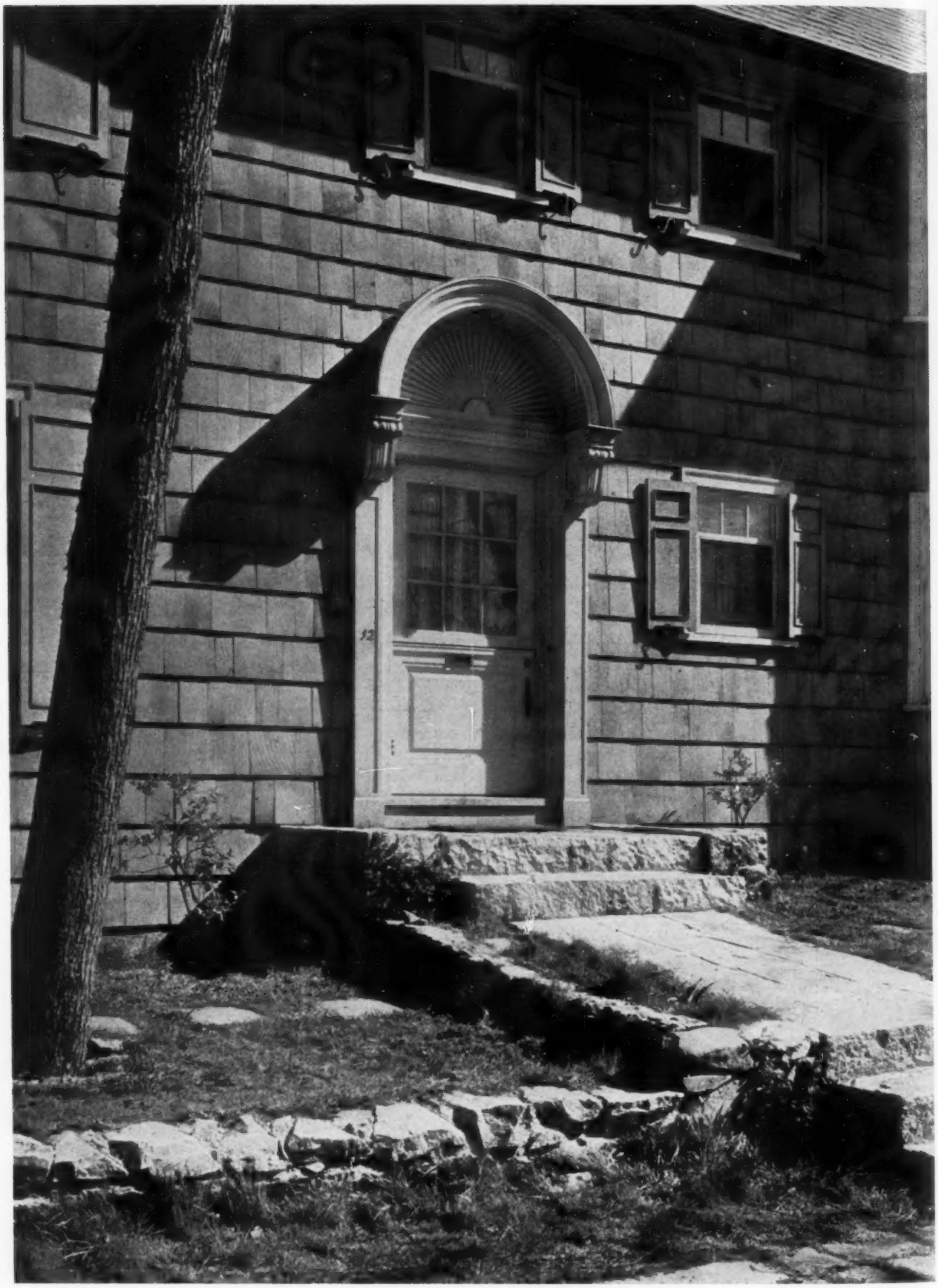
HOUSE OF DR. WILLIAM M. SHEDDEN, CHESTNUT HILL, MASS.
J. ROBERTSON WARD, ARCHITECT



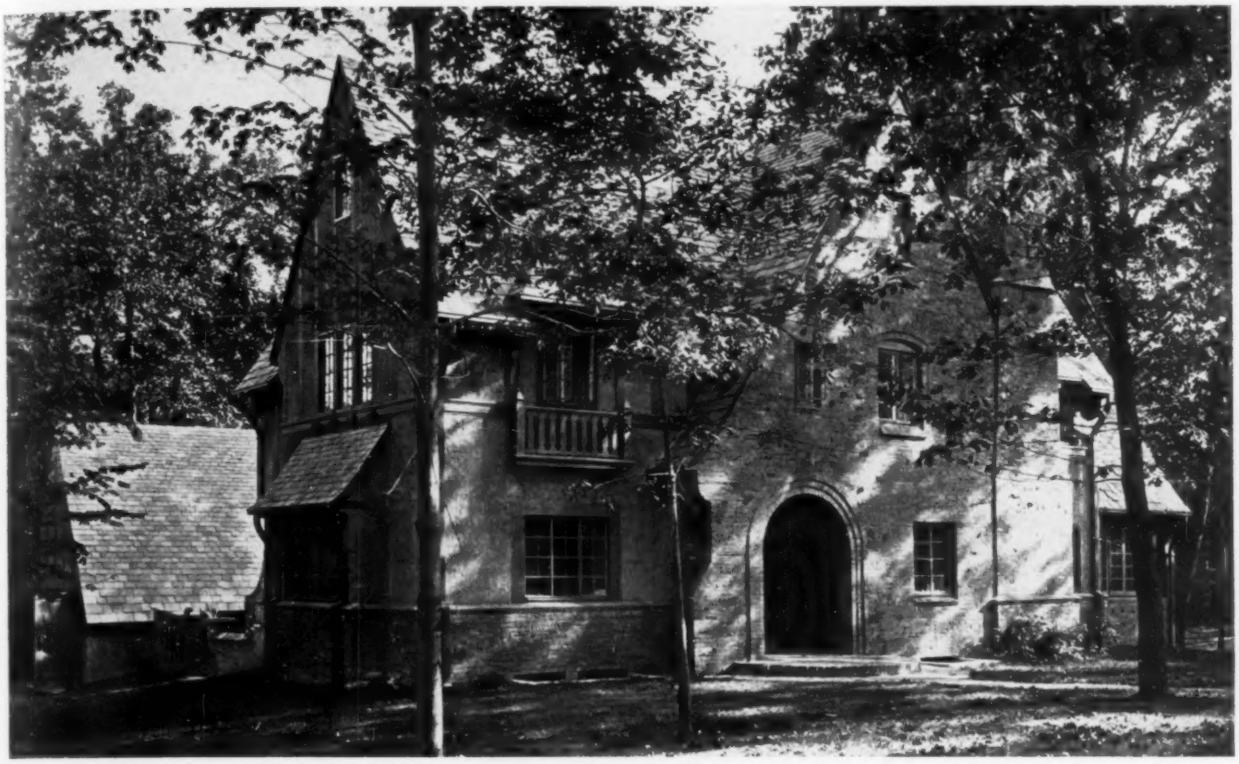

SECOND FLOOR

FIRST FLOOR

THIS is a variation of the New England farmhouse type. 24-inch shingles, laid 10 inches to the weather and stained gray, cover the walls, and ¼-inch green slate is used on the roof. The two-car garage is conveniently located in the service wing, under the two maids' rooms and bath. Off of the large entrance vestibule a coat closet and lavatory are conveniently located. The center stair hall connects the dining room with the living room. Four master bedrooms and two baths are located on the second floor. The two-story bay window on the front of the house adds to its homelike and cheerful character. Two-story bay windows give distinction and quality. They are as appropriate on houses of old English design as on those in Colonial and the later Georgian styles.

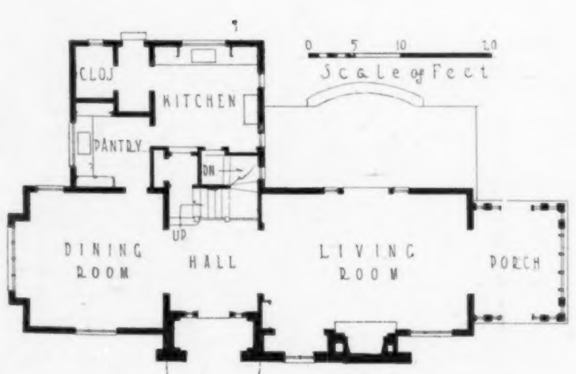


ENTRANCE, HOUSE OF DR. WILLIAM M. SHEDDEN, CHESTNUT HILL, MASS.
J. ROBERTSON WARD, ARCHITECT

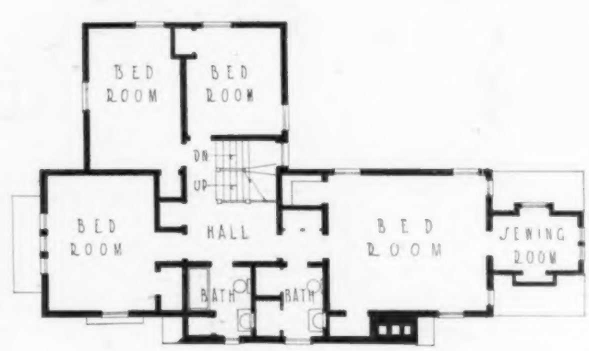


HOUSE OF A. E. BETTERIDGE, ESQ., MONTCLAIR, N. J.
C. C. WENDEHACK, ARCHITECT

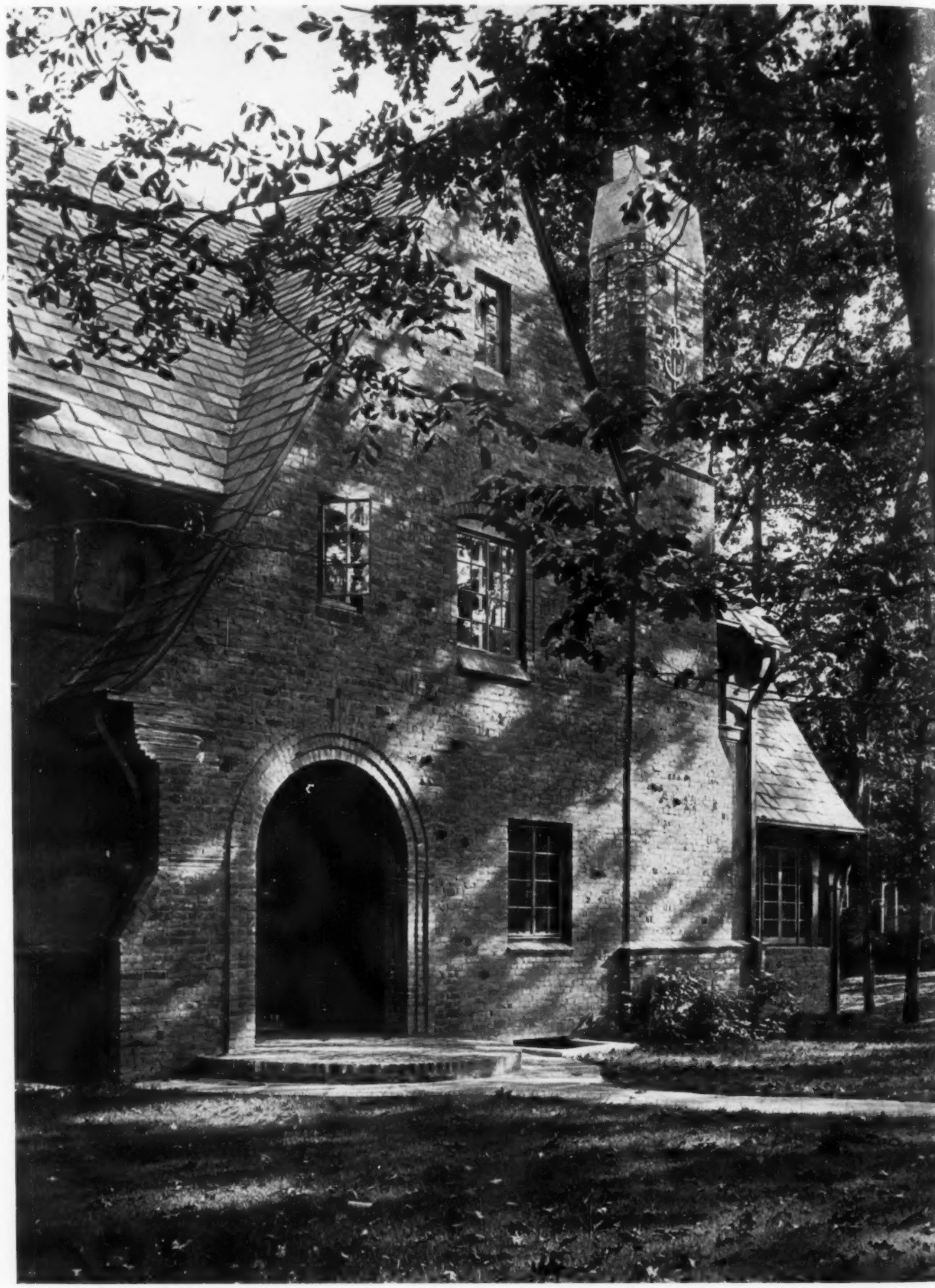
THIS house is rather more sophisticated but no less attractive than the three simple New England houses preceding. A combination of common brick, stucco and half-timber gives this house an English quality, which is very popular with home builders today,—also it is a style particularly appropriate for wooded locations, such as are found in Westchester County and eastern New Jersey. Although the square footage of this house is not large, the height of the steep pitched roof gives additional space for servants' rooms on the third floor. There is more regularity to the plan than the picturesque and unsymmetrical exterior would suggest. A spacious stair hall separates the living room and dining room. Back of the latter is a good sized pantry and excellent kitchen, the kitchen having windows on two sides, which is a desirable arrangement whenever possible. The materials used in constructing this house include brick and stucco on wood frames, slate for the roof, steel casements for the windows, oak for the floors and interior trim, steam for the heating, and sand-finished plaster for the interior walls. The cubic footage is 50,301, and it was built in 1926 for about $27,926.




FIRST FLOOR



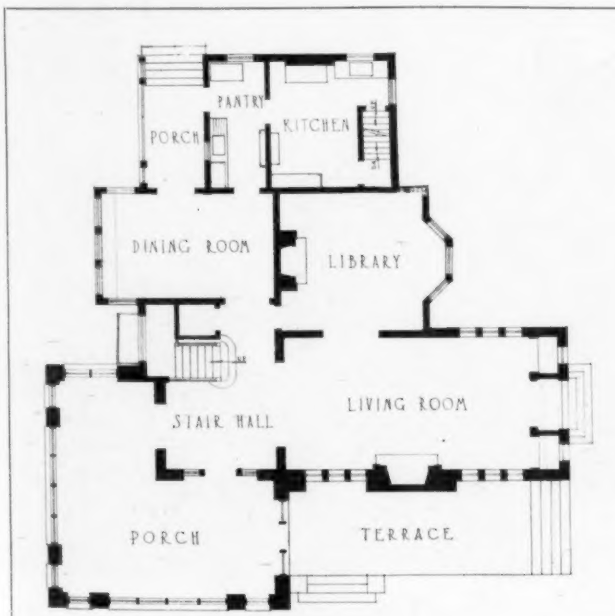

SECOND FLOOR



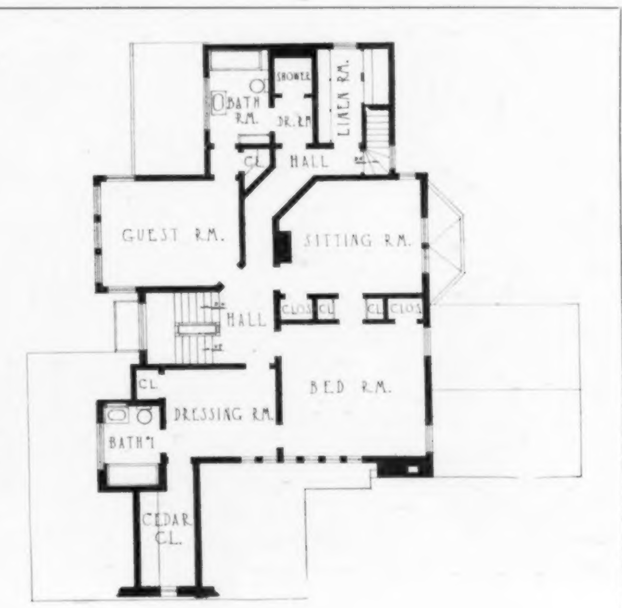
ENTRANCE FRONT, HOUSE OF A. E. BETTERIDGE, ESQ., MONTCLAIR, N. J.
C. C. WENDEHACK, ARCHITECT

HOUSE OF J. R. WILDMAN, ESQ., MONTCLAIR, N. J.
C. C. WENDEHACK, ARCHITECT

THIS cheerful, picturesque house derives much of its charm from the excellent and colorful stonework combined with brick which is used for most of the first story. Stucco and half-timber and vari-colored slate give originality to the upper stories and gables. There is freedom as well as originality in both the design and plan of this house. A terrace and covered porch extend across the front, back of which are located the entrance, stair hall and living room. The splendid height of the roof, which successfully and pleasingly dominates the entire design, makes possible the location of three servants' rooms and baths on the third floor. The construction of this house includes the use of brick, stone, stucco and wood frame for the walls, slate for the roof, steel casements for the windows, oak for the floors and interior finish, and sand plaster for the interior walls. Built in October, 1925, at a cost of $26,000.




FIRST FLOOR




SECOND FLOOR

HOUSE OF J. R. WILDMAN, ESQ., MONTCLAIR, N. J.
C. C. WENDEHACK, ARCHITECT

HOUSE OF MRS. J. D. HAWKINS, MONTCLAIR, N. J.
C. C. WENDEHACK, ARCHITECT

LOCATED on one of Montclair's beautiful hillsides, this picturesque modern version of an English cottage fits well into the landscape. The whole effect of the house is long and low, partly on account of the one-story service wing and garage on the north end of the house. Another detail which adds to the low effect of the design is the characteristically French treatment of the overhanging eaves which are broken by the high dormer windows. The height of these windows is cleverly accentuated by the use of half-timber on either side. Color is given to the design through the use of variegated stone and brick in the entrance bay, main chimney and porch piers. To further carry out this characteristic of color and texture, a heavy rough finish has been given to the


SECOND FLOOR


FIRST FLOOR

LIVING ROOM END, HOUSE OF MRS. J. D. HAWKINS, MONTCLAIR, N. J.
C. C. WENDEHACK, ARCHITECT

stucco which covers the wall surfaces. It is sometimes felt that rough and colorful masonry composed of vari-colored stone and brick is better set off when contrasted by a smoother texture stucco, but the prevailing desire of home owners today seems to be to get as much boldness and roughness of texture as possible in the stucco walls of their houses. The variegated colors of the slate roof add still another note of gaiety to this unusually cheerful house.

In passing, it is interesting to note how much personality some houses possess. Dignity, integrity, austerity and severity are some of the qualities which characterize houses. Many houses possess dignity and integrity, this being particularly noticeable in houses of the French and English Renaissance styles. Austerity and severity are constantly found in the stone houses of England and France and the United States, houses built between 1720 and 1820. Integrity in domestic architecture implies a straightforwardness of purpose and intent evidenced in both the plan and elevations. Many of the plantation houses of the South possess this quality combined with those of hospitality and cheerfulness. Some architects unconsciously put real character into their houses. Especially is this true when the joy of creative inspiration is strongest. This is just the difference which always exists between a house designed by a builder and one designed by an architect. The builder, no matter how conscientious and thorough he may be in the construction of his house, is only building a shelter from the elements, a roof and four walls to support it. On the other hand, the architect sees in this roofed-in, four-walled piece of construction much more than a mere shelter. In his mind it becomes a home, an expression of the life which goes on within it. In his creative imagination, interest and, if possible, beauty must be given to the shell which encloses and protects so priceless and indispensable a place as a home.

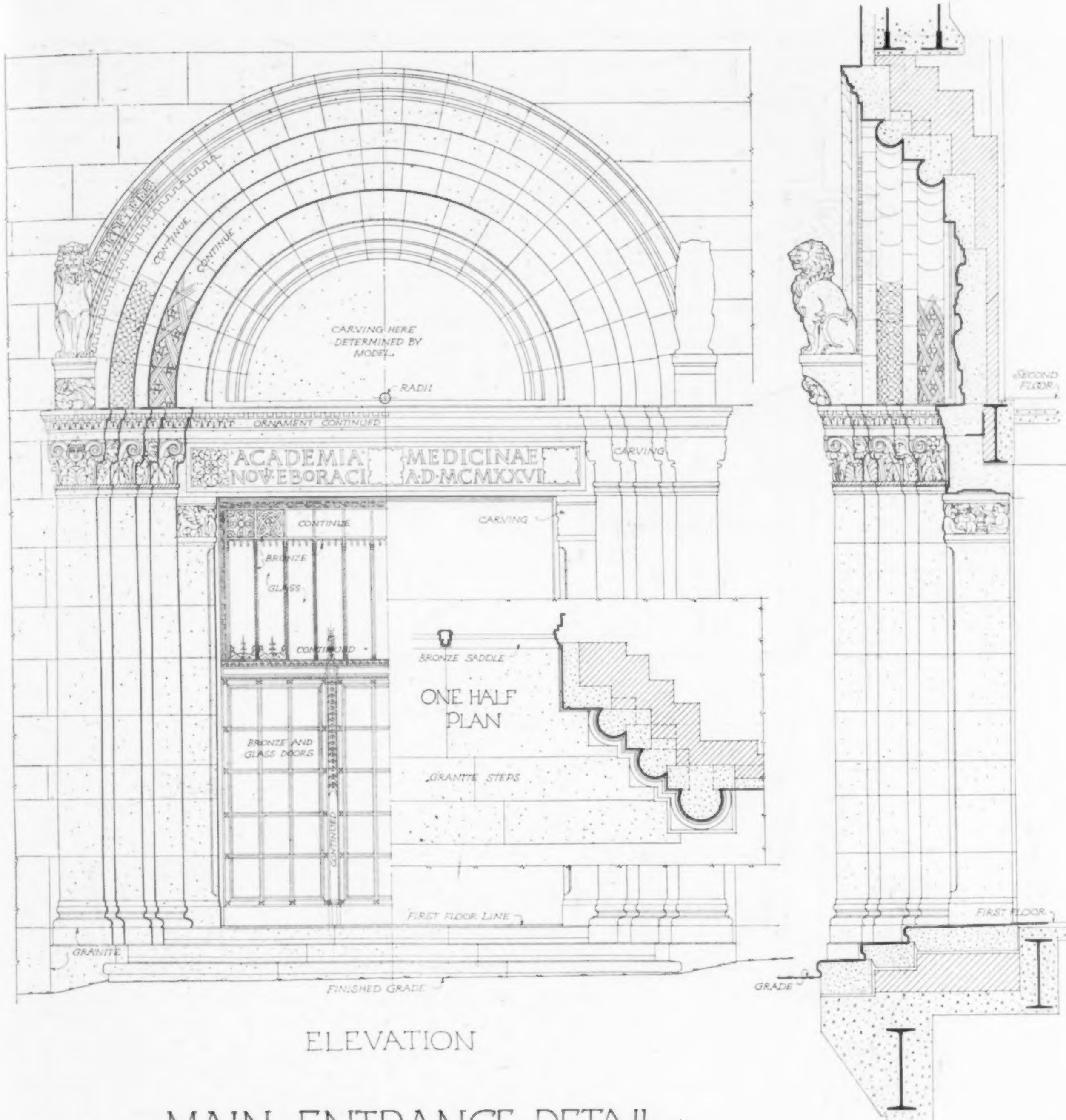
This plan is convenient and well arranged. An entrance vestibule with a coat closet on either side leads into a long center stair hall, which separates the living room on the left from the dining room on the right. Beyond the living room is a covered porch, and back of the dining room are a pantry, kitchen and one servant's bedroom and bath, beyond which is a single-car garage, accessible through the service porch. On the second floor there are three master bedrooms and two baths. As may be seen from the illustrations, the roof is not of sufficient height to permit a third story, although under the ridge pole there is a long open attic reached by a small flight of stairs off the second floor hall. Brick, stucco, half-timber and wood frame are used. Containing 41,116 cubic feet at 62 cents per cubic foot, this house cost when completed in 1925, approximately $25,000.

HOUSE OF STANLEY M. BABSON, ESQ., ORANGE, N. J.
C. C. WENDEHACK, ARCHITECT

In sharp contrast to the English types of houses shown on the preceding pages is this simple farmhouse, which with its brick ends reminds one of some of the old houses found in Connecticut. The Colonial spirit is suggested in this design by the well proportioned, small-paned windows, the gray stained shingles, and the entrance porch. The small wing containing the "den" and porch is excellently carried out with brick walls and a high gable end roof, similar in pitch to that of the main house. The specifications called for wood frame, shingles and brick veneer for the walls, cedar shingles for the roof, oak for the floors, steam for the heating, and white pine for the interior trim. Completed in 1926, this house, with an approximate cubic footage of 35,290, cost 46 cents per cubic foot, or about $17,500.


FIRST FLOOR SECOND FLOOR

HOUSE OF STANLEY M. BABSON, ESQ., ORANGE, N. J.
C. C. WENDEHACK, ARCHITECT




# MAIN ENTRANCE DETAIL

THE NEW YORK ACADEMY OF MEDICINE

YORK AND SAWYER, ARCHITECTS NEW YORK CITY

SCALE IN FEET

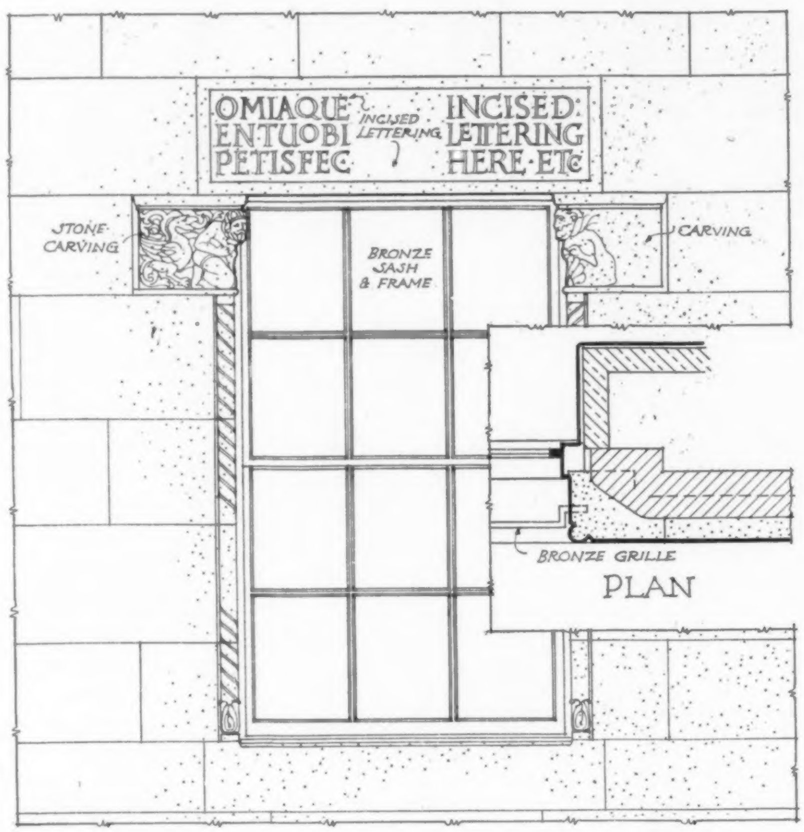
0 5 10 15

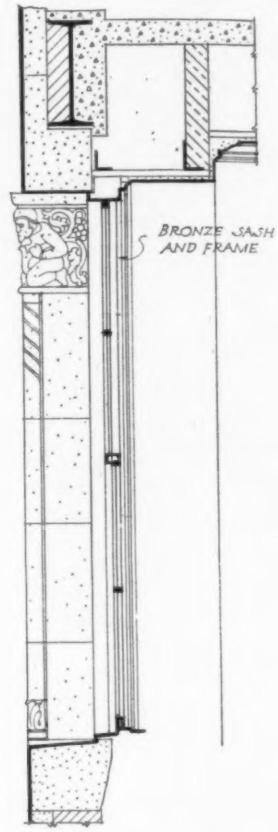
MAY 1928

No. 59

The ARCHITECTURAL FORUM DETAILS

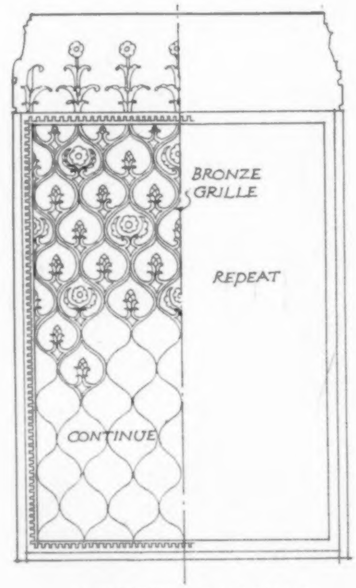
Editor's Note. Illustrations and Plans of the New York Academy of Medicine Were Published in the April Issue of THE ARCHITECTURAL FORUM




ELEVATION

SECTION




ELEVATION OF GRILLE OVER WINDOW

# WINDOW DETAIL ON MAIN FLOOR

## THE NEW YORK ACADEMY OF MEDICINE

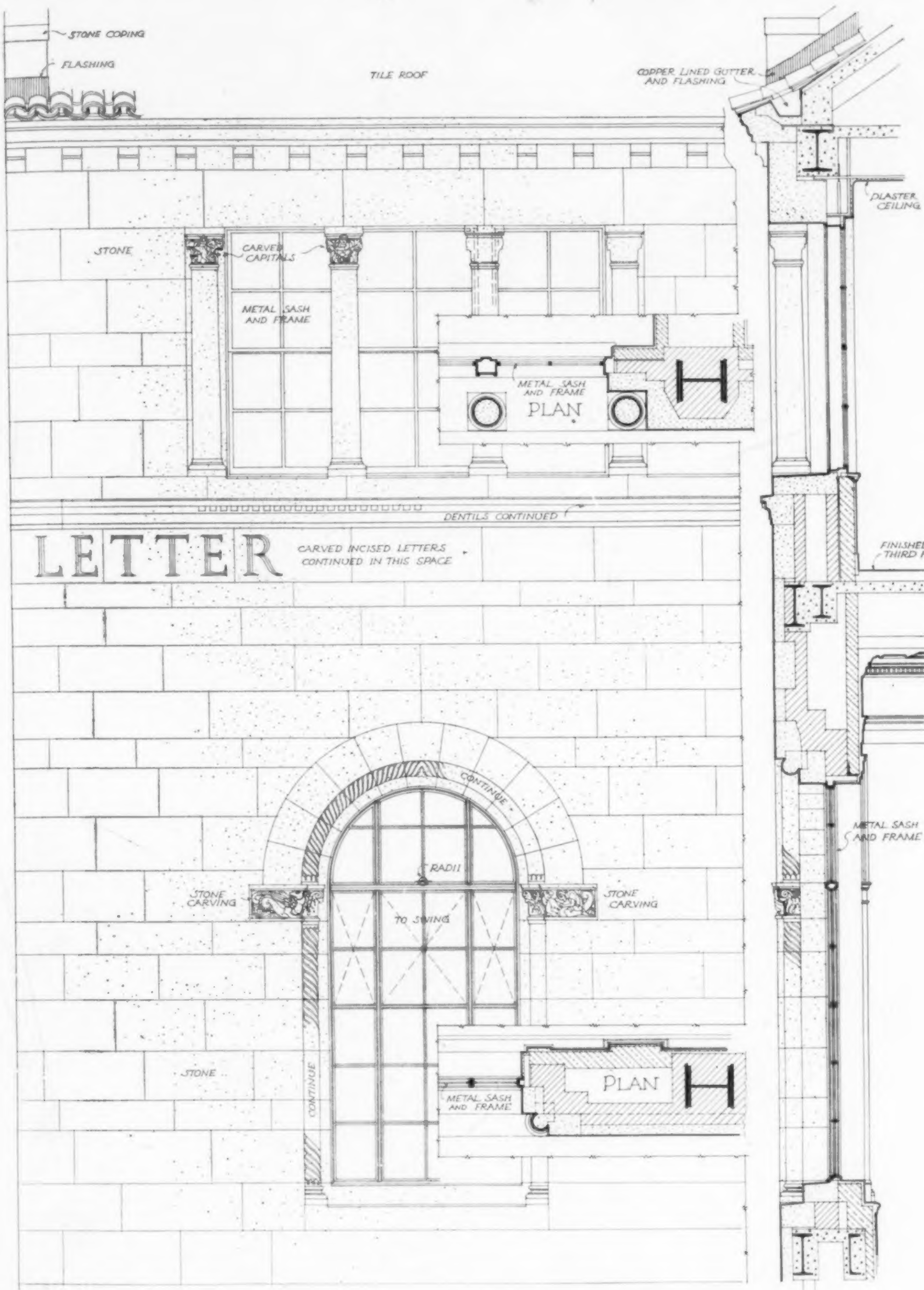
YORK & SAWYER ARCHITECTS, NEW YORK CITY

MAY 1928

SCALE 0 5 10 IN FEET

No. 60

# The ARCHITECTURAL FORUM DETAILS




· ELEVATION · SECTION

DETAIL OF AUDITORIUM WALL ....

THE NEW YORK ACADEMY OF MEDICINE

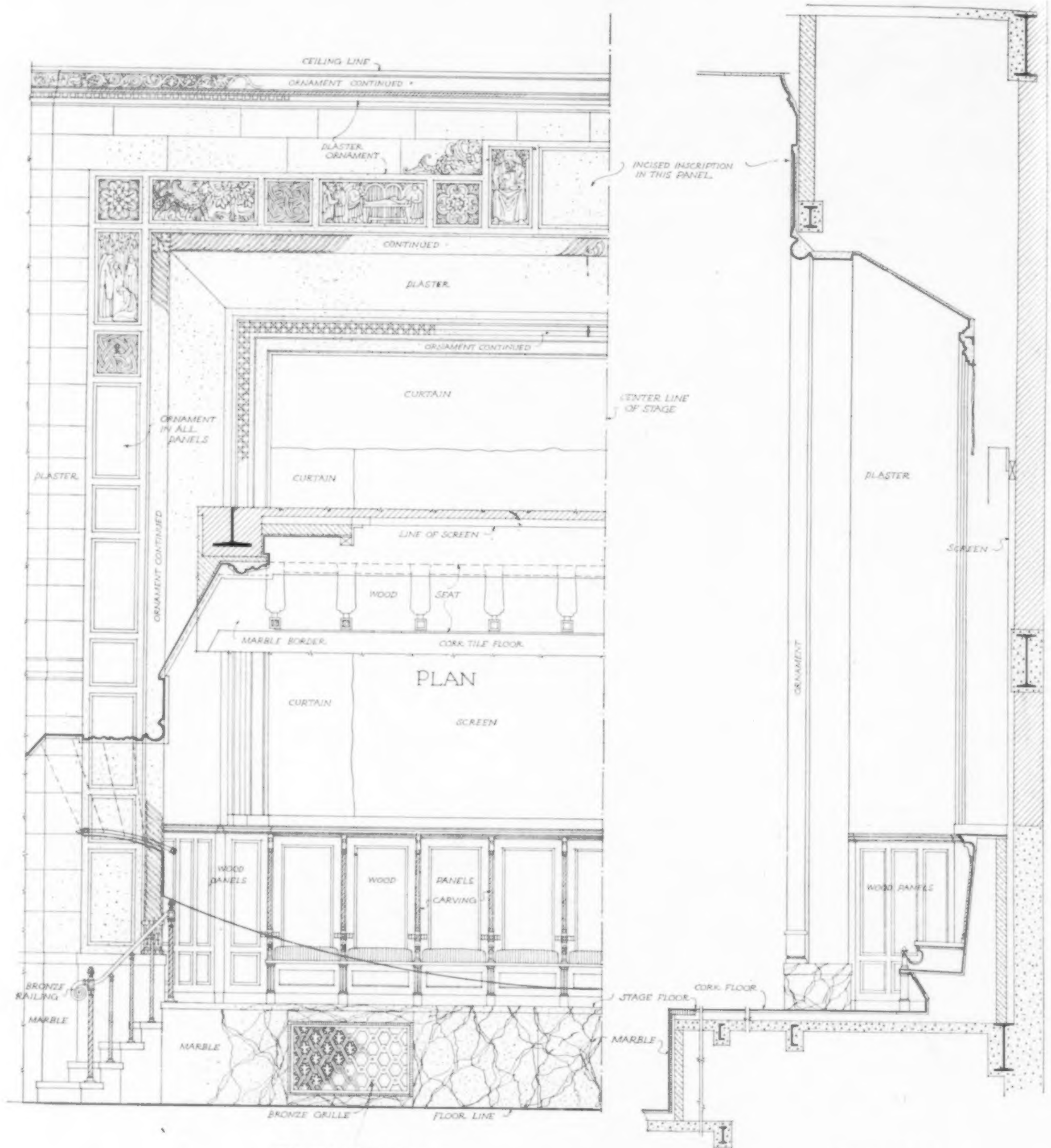
YORK AND SAWYER ARCHITECTS, NEW YORK CITY

SCALE 0 5 10 15 IN FEET

MAY 1928

NO. 61

The ARCHITECTURAL FORUM DETAILS




ELEVATION

SECTION

· DETAIL OF STAGE ·

THE NEW YORK ACADEMY OF MEDICINE

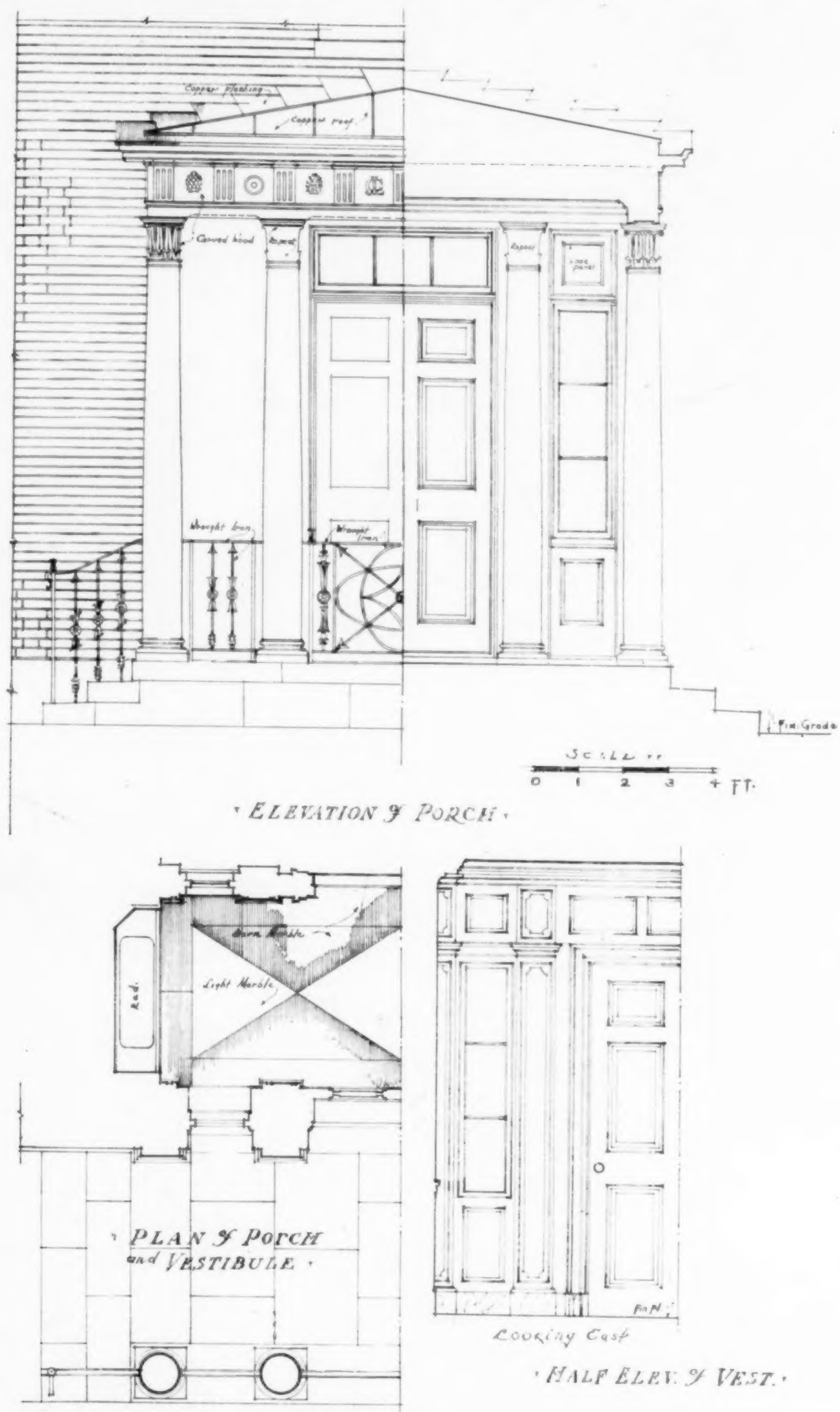
YORK AND SAWYER ARCHITECTS NEW YORK CITY

SCALE 0 5 10 15 IN FEET

MAY 1928

No. 62

# The ARCHITECTURAL FORUM DETAILS



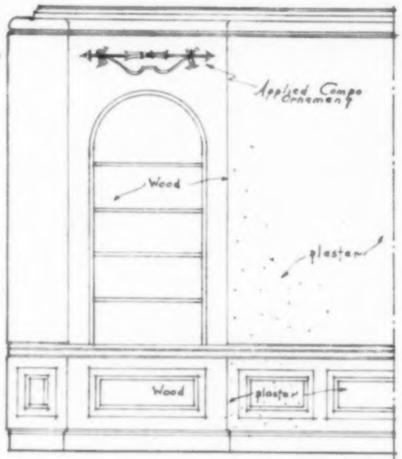

ENTRANCE PORCH
HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD
PHILIP L. GOODWIN, ARCHITECT

MAY 1928

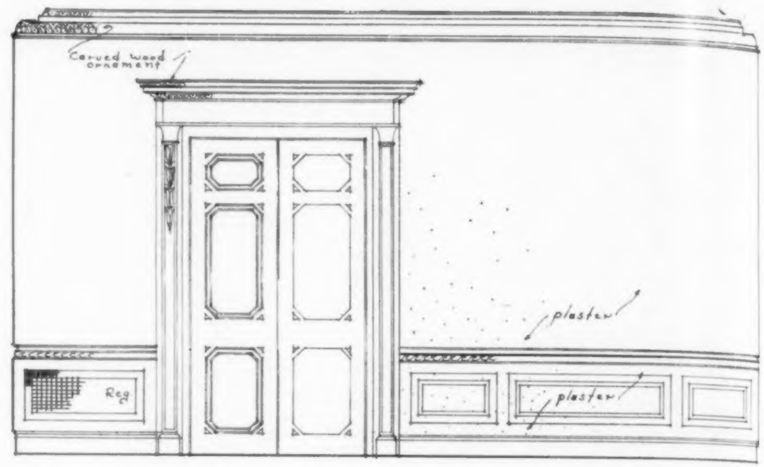
No. 63

The ARCHITECTURAL FORUM DETAILS

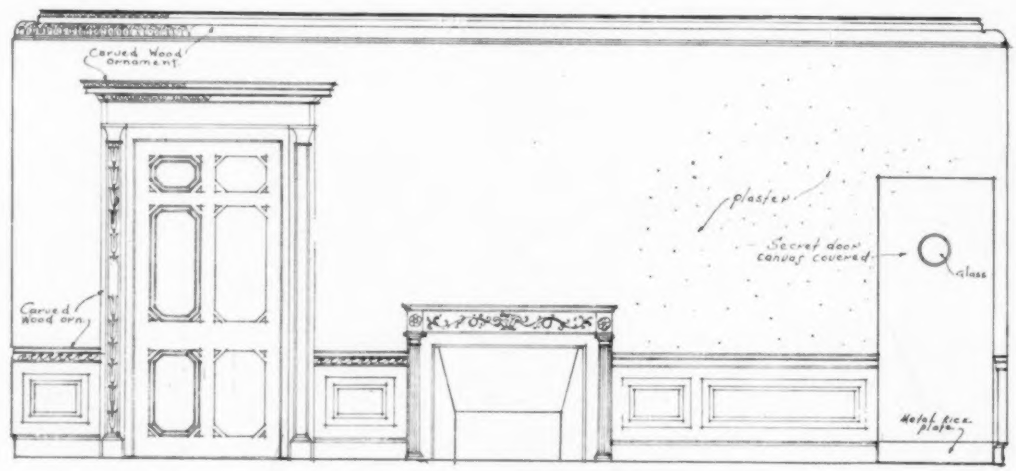
Editor's Note. Illustrations and Plans of the House of James L. Goodwin, Esq., Were Published in the April Issue of THE ARCHITECTURAL FORUM




· Half North Elevation ·




· South Elevation ·




· West Elevation ·

· DETAILS OF DINING RM. ·

SCALE

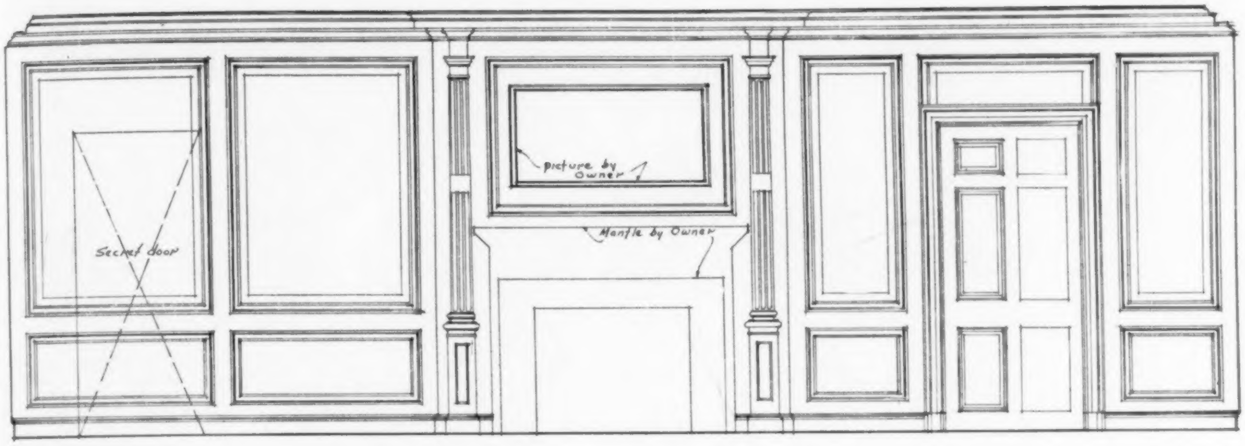
0 1 2 3 4 5 ft.

MAY 1928

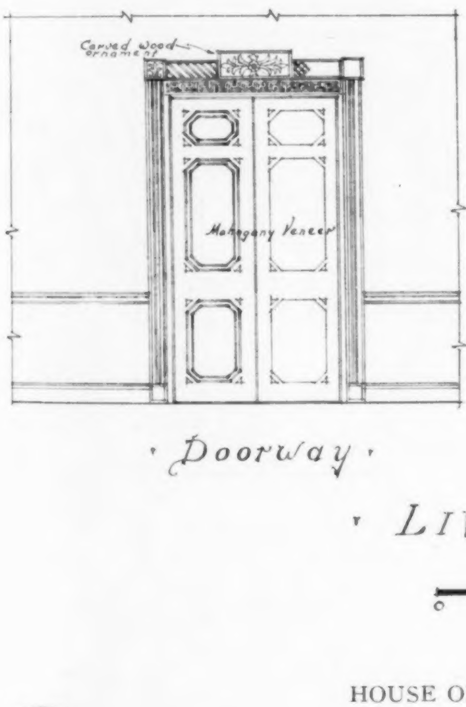
HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD

PHILIP L. GOODWIN, ARCHITECT

No. 64




West Elevation





· Doorway ·     · South Elevation ·

· LIVING ROOM ·

SCALE

0 1 2 3 4 5 6 ft.

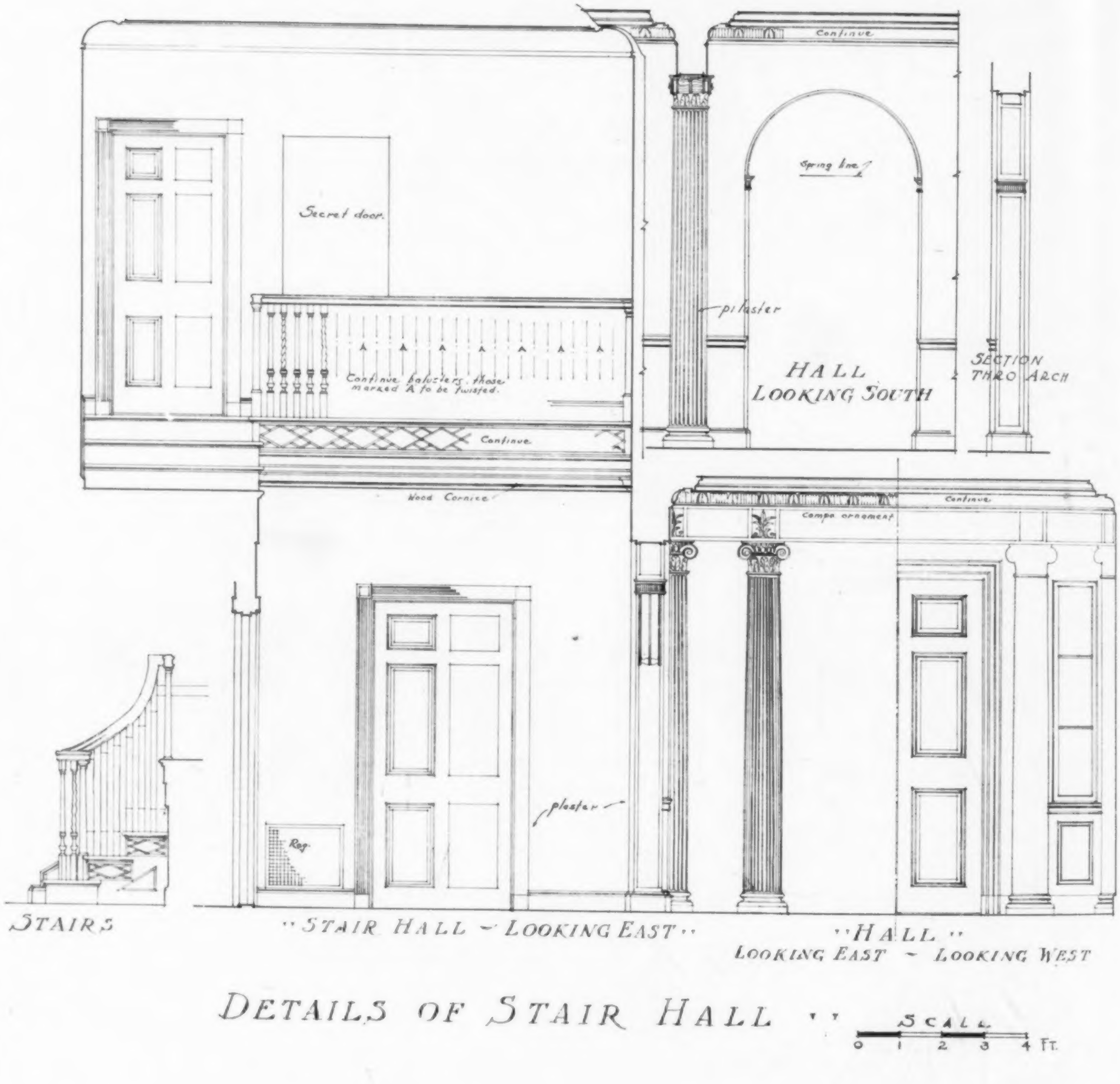
HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD

PHILIP L. GOODWIN, ARCHITECT

MAY 1928

No. 65

The ARCHITECTURAL FORUM DETAILS




DETAILS OF STAIR HALL

HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD

PHILIP L. GOODWIN, ARCHITECT

MAY 1928

No. 66

*Courtesy of Lewis Copeland Company* Louis Bromberg

"GIRDERED STEEL"

From a Woodcut by Louis Bromberg

THE
ARCHITECTURAL
FORUM

VOLUME XLVIII NUMBER FIVE

MAY 1928

# COLLABORATION IN BRIDGE DESIGNING

## I. THE ARCHITECT

BY
GILMORE D. CLARKE
LANDSCAPE ARCHITECT, WESTCHESTER COUNTY PARK COMMISSION

GRANTING that human happiness is greatly enhanced by beautiful and pleasing surroundings, it is highly desirable that utilitarian structures, such as bridges, should be as pleasing to the eye as it is practicable to make them, and that there should be a greater collaboration between the architect and engineer, with a realization on the part of each that science without art is apt to be unattractive, and art without science inefficient."—*Wilbur J. Watson.*

Ten years ago this spring, engineers of the American army were engaged in the construction of bridges across the streams in France to make possible the advance of the allied armies. The engineers were an important link in one of the greatest organizations of men ever assembled, and with a spirit of coördination and coöperation with other services these men made possible the advance of the armies over streams on bridges improvised at short notice. These bridge structures varied from *passerelles,* constructed of rafts kept afloat by gasolene cans, to steel structures of long multiple spans; naturally, appearance counted for naught so long as the structures sufficed for the exigencies of the occasion. We are concerned here with the design of unsightly and purely utilitarian bridges only insofar as to prevent, if possible, their construction on highways, railroads, and elsewhere. Such structures are good enough when built by armies in time of war, but they have no place in our modern civilization where beauty ought to be a much a part of life as food or shelter. But many, unfortunately the majority, of our modern highway and railroad bridges designed by engineers possess little if any more artistic merit than did those wartime structures. The creation of beauty is not primarily the business of engineers, and to obtain beauty we must call upon another profession, that of architecture. Bridges cannot be designed by engineers alone, nor by architects alone. Bridge design may be considered both an art and a science, which of course is true of almost every type of modern building construction. The fact that there have been few, if any, bridges designed by engineers within the past decade which can be said to possess beauty is a sufficient reason for considering the members of the engineering profession unfit to continue in this important work without the aid of architects. The engineer must be brought to a realization of the fact that the art and science of bridge building constitute a joint problem for architect and engineer.

When asked to prepare an article on bridges, I immediately replied that I thought the preparation of the article should be collaborative, since the architect's contribution is but one phase of bridge design. Modern bridge design must be based upon coöperative effort on the part of architect and engineer, just as during those trying times ten years ago the war had to be conducted by the coöperative effort of infantryman, engineer, artillerist, etc. No one branch of the army service could have won the war alone; neither can the engineer alone produce a bridge structure possessing beauty of line, of mass, of texture, of detail. There is, nevertheless, a tendency today on the part of many an engineer to think that the bridge is solely his problem. We see the results all around us, expressed in hideous bridge structures on highways, railroads, and even in some of our parks. Of course there are exceptions, illustrated by such examples as some of the large river bridges about New York which are the result of collaborative design. The designing of bridges requires creative ability of the first order, from the standpoint of artistic as well as of scientific design. Collaborative effort is required, and both architect and engineer must realize that fact. A tremendous amount of effort on the part of that group of broad-gauged engineers who realize that the architect is necessarily a contributor in part to the design of the bridge, is required before artistic bridges will take the places of the ugly structures which are a disgrace to our civilization. The engineers with whom I have collaborated in the designing of many bridges believe thoroughly in collaborative bridge design. That neither architect nor engineer can alone design a satisfactory bridge structure has been proved to them. And they further believe that the architect must do more than merely attempt to "dress up" an engineering design; he must work on the problem with the engineer from the beginning. It has been shown conclusively by the engineers with whom I have collaborated that artistic bridges can be designed

Footbridge at Garth Lake, Scarsdale, N. Y.
Bronx River Parkway

Garth Woods River Bridge
Chester E. Wheeler, Designer

so as to cost very little, if any, more than the ugly.

In spite of a full knowledge of these facts, our nearby neighbors, the engineers in charge of the great program for the elimination of grade crossings in the Empire State, are unwilling to take heed, and still continue to perpetrate upon our highways structures that are a disgrace to an intelligent public. Their designs are still of the types originally developed when reinforced concrete was first used; or, if steel, are similar to those designed 50 years or more ago. How long the public will tolerate the construction of these concrete and steel monstrosities it is hard to tell. The bridge has apparently wandered a long way from the architectural fold of which it was once so charming and honored a member, and I hope the architect may be able to call it back.

In New York state there was for a time some hope of getting artistically acceptable bridge struc-

"Bridge 33," Bronx River Parkway, Hartsdale, N. Y.
Gilmore D. Clarke, Architect A. G. Hayden, Designing Engineer

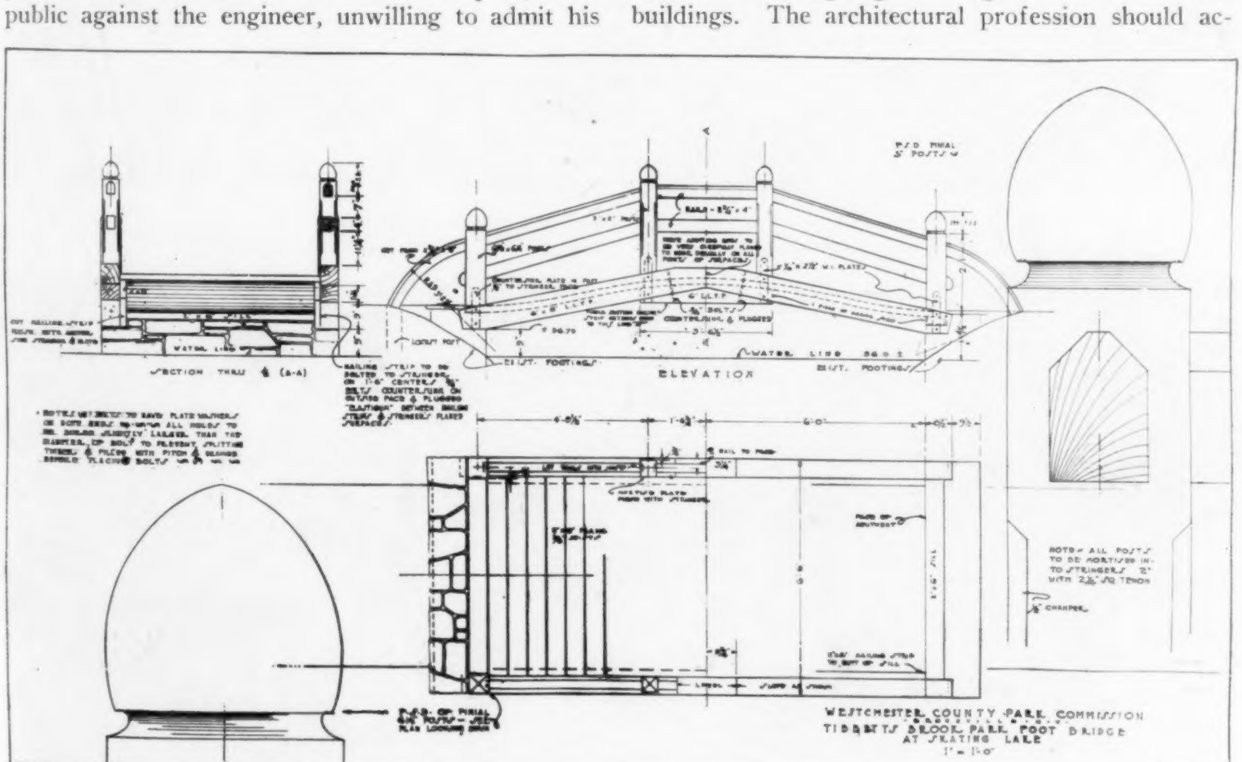
Photos. Nyholm

Footbridges, Tibbett's Brook Park, Yonkers, N. Y.

Gilmore D. Clarke, Landscape Architect

A. R. Jennings, Designer

tures for our highways and railroads by reason of the formation of the state Fine Arts Commission, authorized by law to pass upon all structures for which state funds were spent in whole or in part. This Commission functioned effectively for a time, but was abolished a few months ago, and the state has thereby moved backward a decade or more. At present there is no control whatever to protect the public against the engineer, unwilling to admit his limitations, and who designs an ugly bridge which is an insult to the taste of the people who pay for it. The public needs to be informed in full concerning the facts; ugliness is not wanted; it will not be long tolerated. It is time for the architects to act, and I for one believe that the engineering profession will take the stand that the architect should be a collaborator in the designing of bridges as well as of tall buildings. The architectural profession should ac-




Working Drawing of Footbridge, Tibbett's Brook Park

Bridge Over Bronx River, South of Gun Hill Road, New York
Carrere & Hastings, Architects — Guy Vroman, Designing Engineer

cept the challenge and make it a duty encumbent upon it to see that art becomes an inherent part in the design of bridge structures throughout the nation. Noble bridges live longer than any other structures built by man, as many of the old bridges of Europe bear witness,—the *Pont du Gard,* attributed to Agrippa, built in 19 B.C.; the *Ponte Sant' Angelo* in Rome, started by Hadrian; the old *Pont Neuf,* the finest over the Seine in Paris, and many others.

Accompanying this article are illustrations and sketches of several bridge structures built or to be built in parks and along parkways in the County of Westchester, New York, by the Bronx Parkway and Westchester County Park Commissions and designed by architects and engineers in close collaboration. A number of the structures are river crossings; others are at the intersections of parkways with highways, where a separation of grades is imperative for the

Palmer Avenue Crossing of Bronx River Parkway
Charles W. Stoughton, Architect — A. G. Hayden, Designing Engineer

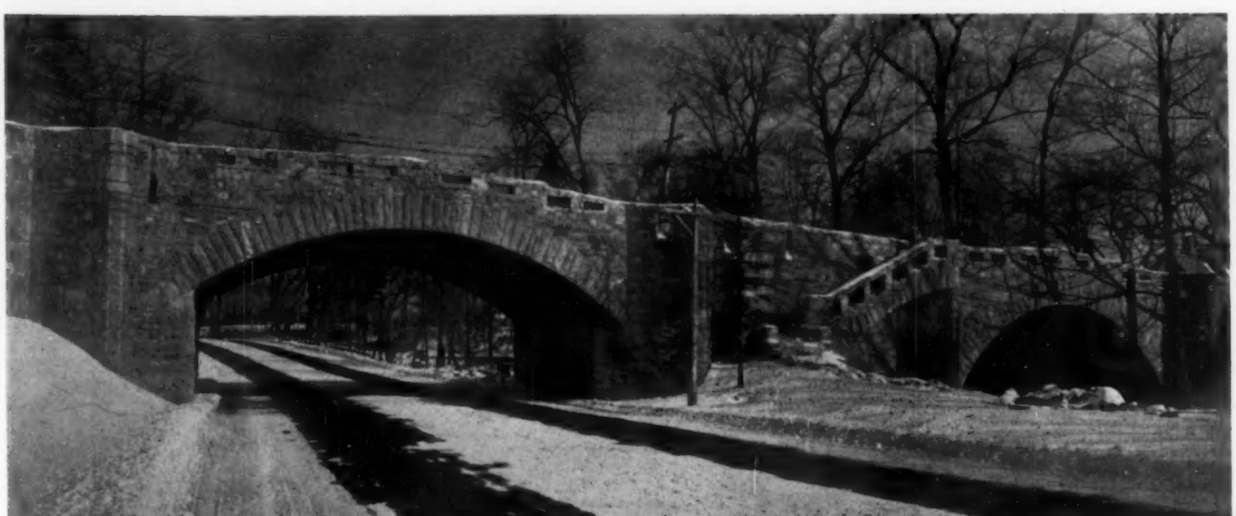
New Rochelle Road Bridge, Hutchinson River Parkway
Gilmore D. Clarke, Architect — A. G. Hayden, Designing Engineer

Bridge Over Bronx River at Tuckahoe, N. Y.
Gilmore D. Clarke, Architect A. G. Hayden, Designing Engineer

safety of modern transportation by automobile. Parkway systems are being developed, and similar types of bridge structures will be required, and let us hope that those charged with the conducting of the work spare no effort in order to clothe every structure with a charm only possible when aided by the creative ability of the artist.

Modern bridge design necessitates the use of steel and concrete. Neither one of these materials harmonizes with a naturalistic countryside, more particularly where rock outcrops abound; therefore the bridges of the Westchester County Park System have been faced with native stone, utilizing the latest developments in engineering design for steel or reinforced concrete. In sections of the country where it is impracticable to obtain stone for facing bridges and where the concrete must be exposed, that material can of course be interestingly treated. There

Tuckahoe Road Crossing, Bronx River Parkway
Delano & Aldrich, Architects A. G. Hayden, Designing Engineer



Bridge Over Bronx Parkway Reservation, Scarsdale, N. Y.
Charles W. Stoughton, Architect A. G. Hayden, Designing Engineer

Masonry Details, Bridges of Hutchinson River Parkway
Gilmore D. Clarke, Architect

are many bridges of concrete which possess beauty of mass, of line, and of detail, and which harmonize with their surroundings. Where it is necessary to span railroads, a steel arch is often used in place of the stone-faced reinforced concrete arch, since the railroads are unwilling to bear the burden of the cost of a stone and reinforced concrete structure. A steel arch springing from stone-faced concrete abutments has been proved to be no more costly than the ugly, heavy steel girders on concrete abutments, which railroads are accustomed to build. The New York Central Railroad has coöperated splendidly with the Westchester County Park Commis ion where parkway and railroad closely parallel each other and where single structures must be had to eliminate grade crossings of intersecting highways.

We are making rapid progress in eliminating the ugly bridge, but there is still a great deal of work to be done, and the architects' aid must be enlisted to the end that the bridges of America may possess the same charm as those of Europe. Bridges are a measure of our civilization, as they have been for centuries. Do we want our present generation measured by the ugly bridges we see dotted along our highways, or by bridges treated by artist and engineer, æsthetically good and structurally sound?

Bridge Over Bronx River Parkway, Crestwood, N. Y.
Bowdin & Webster, Architects A. G. Hayden, Designing Engineer

# COLLABORATION IN BRIDGE DESIGNING

## II. THE ENGINEER

BY

LESLIE G. HOLLERAN

DEPUTY CHIEF ENGINEER, WESTCHESTER COUNTY PARK COMMISSION

WHAT has the engineer to do with bridge architecture or, for that matter, with the architecture of any structure? On the one extreme he may become the passive servant of the architect, and possibly lend himself to the perpetuation of unsuitable or uneconomical structural forms; on the other hand, he may become his own architect, with the disastrous results, from an artistic viewpoint, which Mr. Clarke has pointed out in the accompanying article. These extremes are equally undesirable. Between them, however, lies the middle ground of active coöperation between the engineer and the architect, by which the engineer is often able to lead the architect away from use of architectural designs which involve bad engineering, and by which on the other hand the architect must sometimes convince the engineer that a certain form of structure is bad architecturally or unsuited to the surroundings in which it is to be placed. It is gratifying to know that this active coöperation, which has long been customary in Europe, is gradually becoming more common in the United States. The movement in this direction will undoubtedly be accelerated by pressure from the general public, which is gradually acquiring a keen appreciation of properly designed structures that harmonize with their surroundings. This public will not much longer tolerate additions to our past mistakes in the way of ugly structures, such as continue and will continue to disfigure urban vistas and suburban landscapes everywhere throughout our land until they are worn out or torn down through obsolescence.

This appreciation of better design is, strangely enough, being fostered to a very great extent by strictly commercial interests, such as the manufacturers of our motor vehicles, musical instruments, radios, and other everyday equipment, in which mechanical design has reached a high degree of perfection; and improvement in outward appearance has become one of the principal aids to sales promotion. The problem of adapting structural forms to satisfactory architectural requirements is often difficult and frequently requires the discarding of ideas and methods which have been considered essential since scientific design originated. While the basic theories of structural design, which are founded on natural laws, must necessarily be retained, the requirements of the engineer and those of the architect can, nevertheless, be brought into substantial conformity if there is a sufficient desire to have them do so. It will never be possible to reach common ground if the engineer assumes the attitude that the structural requirements are of paramount importance, nor if, on the other hand, the architect is unalterable in the belief that the architectural requirements are supreme. In any given problem it will almost invariably be found that the requirements of one or both can be modified without greatly compromising the requirements of either.

The architectural and structural forms illustrated

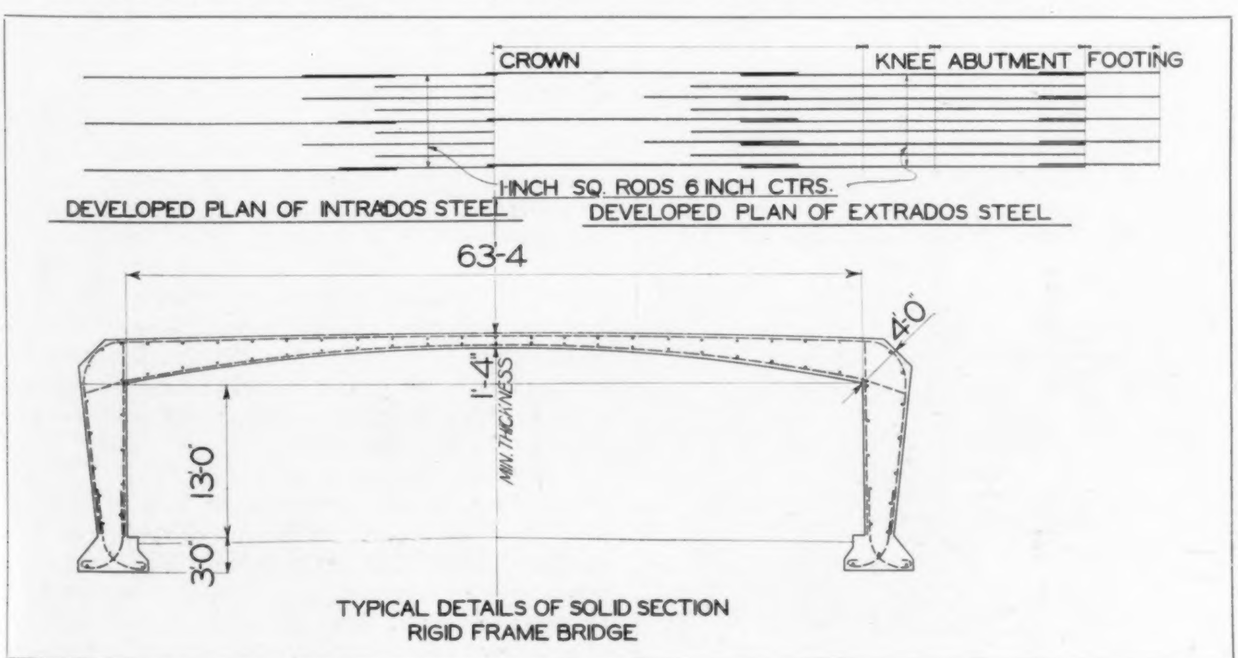
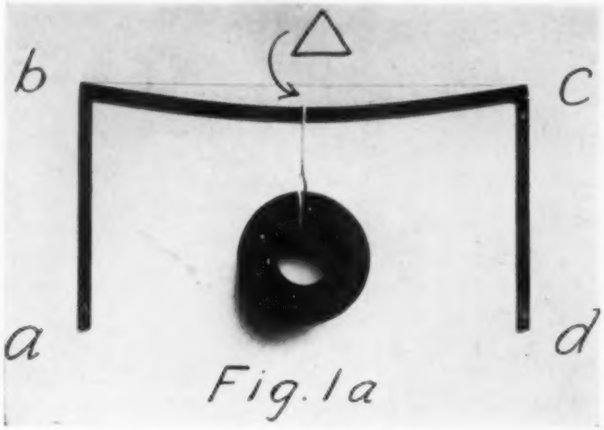
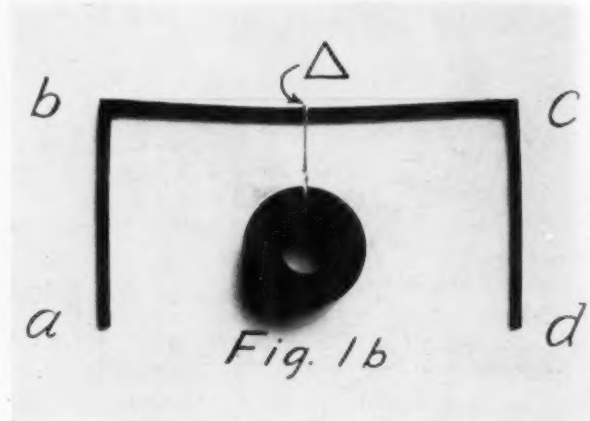



Fig. 1




Model of Girder Abutment Bridge. Girder Simply Rests on Supports




Model of Continuous Rigid Frame Bridge. Girder and Supports Form One Frame

in these pages were, it is true, adapted to the requirements of park and parkway construction, but there is nothing inherent in their design or construction which would preclude their use on highways throughout the country. Fig. 1 shows the design of a rigid frame reinforced concrete structure which was adapted for use in bridge construction by the Westchester County Park Commission's designing engineer, A. G. Hayden. Mr. Hayden describes this design in these words:

"The principle of continuity (rigid frame construction) was deliberately applied in the invention of a new structural form calculated to best meet conditions imposed by restricted headroom at highway crossings and possessing the utmost flexibility for architectural treatment. New methods of design were developed, which permitted great improvement over the few existing examples of simple frame construction. Moreover the new type of structure showed substantial economy over many other types.

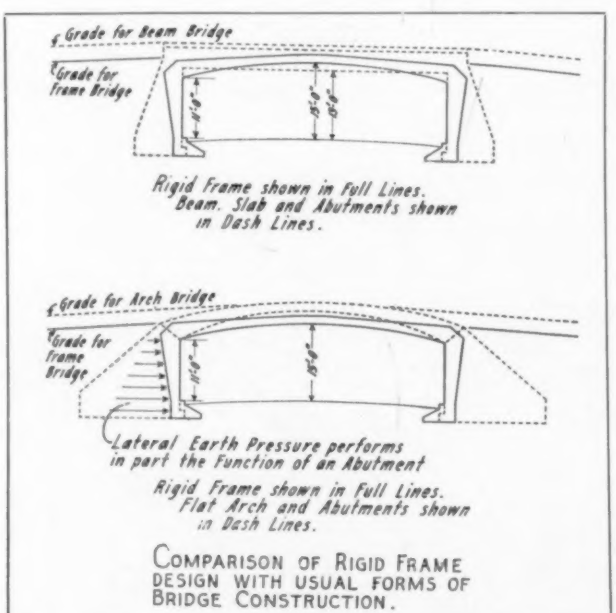



Fig. 2

Fig. 1 illustrates a statically indeterminate structure, that is, one in which analysis of the stresses is impossible by the principles of statics alone. The determination of the stresses is possible, however, by higher forms of analysis. It is beyond the scope of this article and the ability of the writer to enter into a thorough discussion of stress analysis for indeterminate structures. Those who desire to go more fully into the matter of design are referred to articles by A. G. Hayden, *Engineering News-Record*, January 11, 1923, p. 73; *Engineering News-Record*, April 29, 1926, p. 686; by Professor George E. Beggs of Princeton University in the "Proceedings of the American Concrete Institute, 1923." Figs. 1-a and 1-b will indicate clearly the difference between the statically indeterminate rigid frame and another common type of construction. In Fig. 1-a is shown a model of a girder-abutment bridge of three parts, a girder simply resting on two supports. A load is applied and a certain deflection, $\Delta$, is observed. It should be noted that in this form of structure the supports play a purely passive part and are subject to compressive stress only. In Fig. 1-b the same parts are used, but the girder is rigidly connected to the supports. We now have a structure which is continuous from the foundation on one side around to the foundation on the other side. The same load is applied, and it is found that the deflection, $\Delta$, is now less than half what it was before. The flexure in the supporting members indicates that they are now doing part of the work. The conclusion to be drawn from these models is that less material is required in the continuous rigid frame structure than in the discontinuous girder-abutment design, to carry the same loads.

Comparative estimates of the costs of different types of construction for the same location indicate that the rigid frame type has an advantage in the matter of cost of from 8 per cent to 10 per cent over other types of construction. The question naturally arises as to why, if there are advantages in the way of economy and adaptability, this form of construction has not been seized upon for general use. One

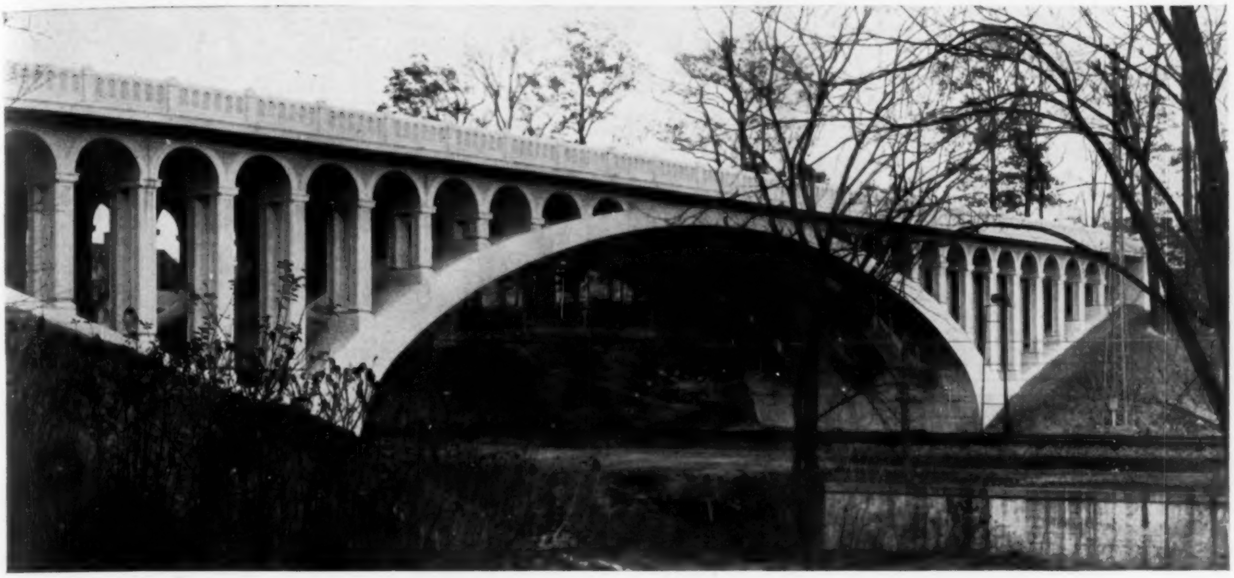


Fig. 3. Reinforced Concrete Bridge, Bronx River Parkway, near White Plains, N. Y.
Palmer & Hornbostel, Architects — Guy Vroman, Designing Engineer

reason is that inertia must always be overcome before an innovation of any sort is generally adopted, and the second is that while most engineers in general practice are able to handle beam-abutment designs, reinforced concrete girder-slab-abutment designs, or even reinforced concrete arch designs, they are alarmed at the apparent complexity of the mathematics which must be employed in the designing of many statically indeterminate structures. It has been found in the work of the Bronx Parkway Commission and the Westchester County Park Commission, however, that as the designing of structures proceeds, new and shorter methods are continually being developed. These are being published in the technical journals, and as they become more and more widely known, they will, no doubt, be more generally adopted for use in highway bridge construction and for grade crossing elimination work.

In Fig. 2 the advantages of the rigid frame design in the way of economy of material, increase in headroom due to decrease in depth of material, and resulting decrease in grades for the same length of

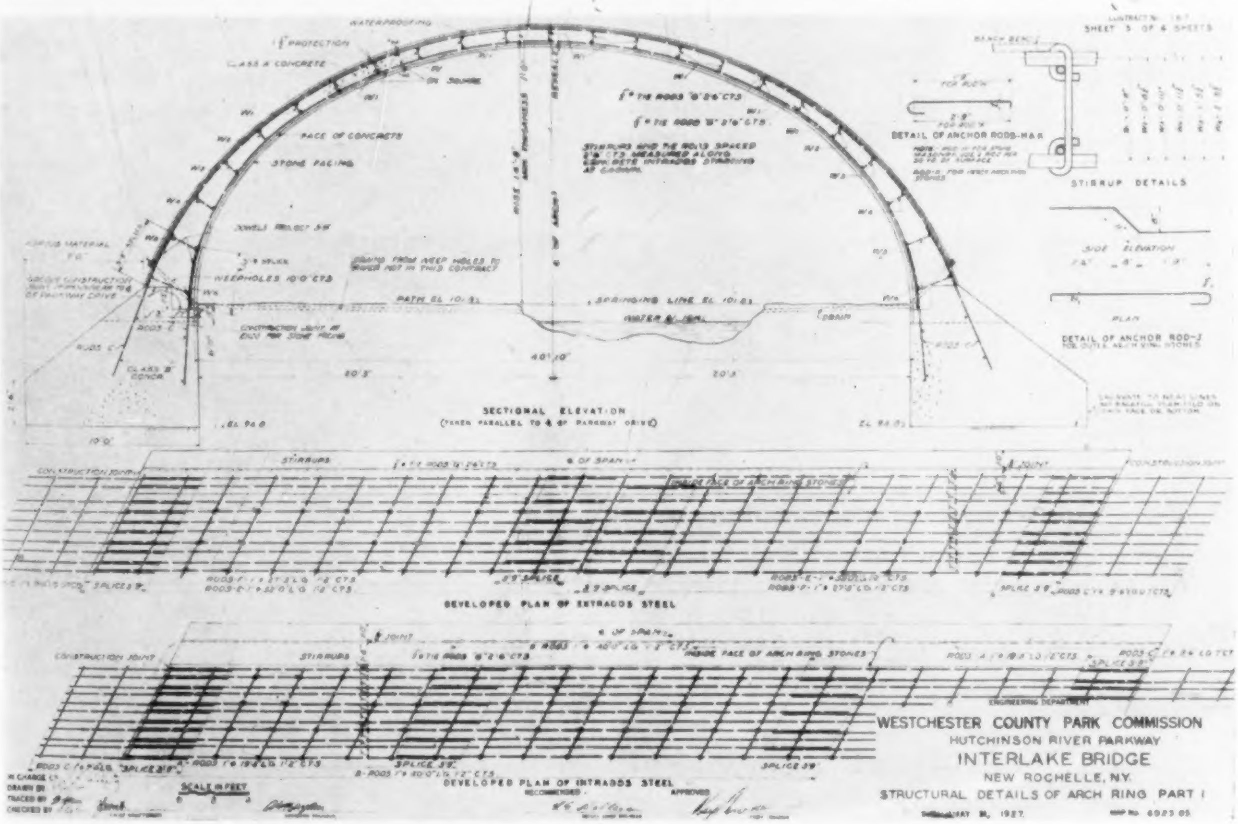



Fig. 4. Economical Type of Reinforced Concrete Arch


Fig. 5
Architectural Design for Odell Avenue Bridge, Saw Mill River Parkway
Stone Faced Rigid Frame Span at Left. Steel Rigid Frame at Right
Gilmore D. Clarke, Architect — A. G. Hayden, Designing Engineer

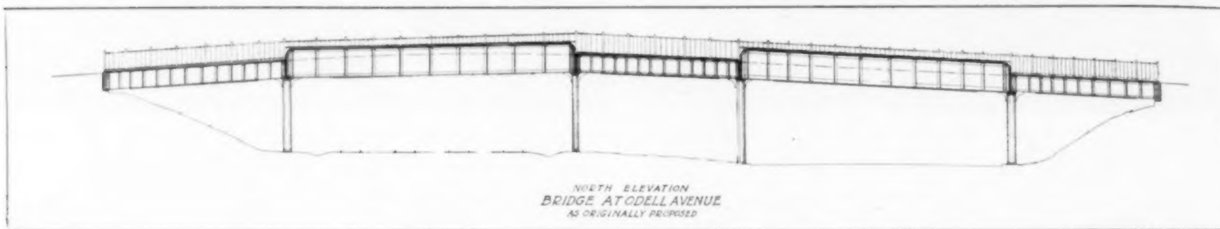
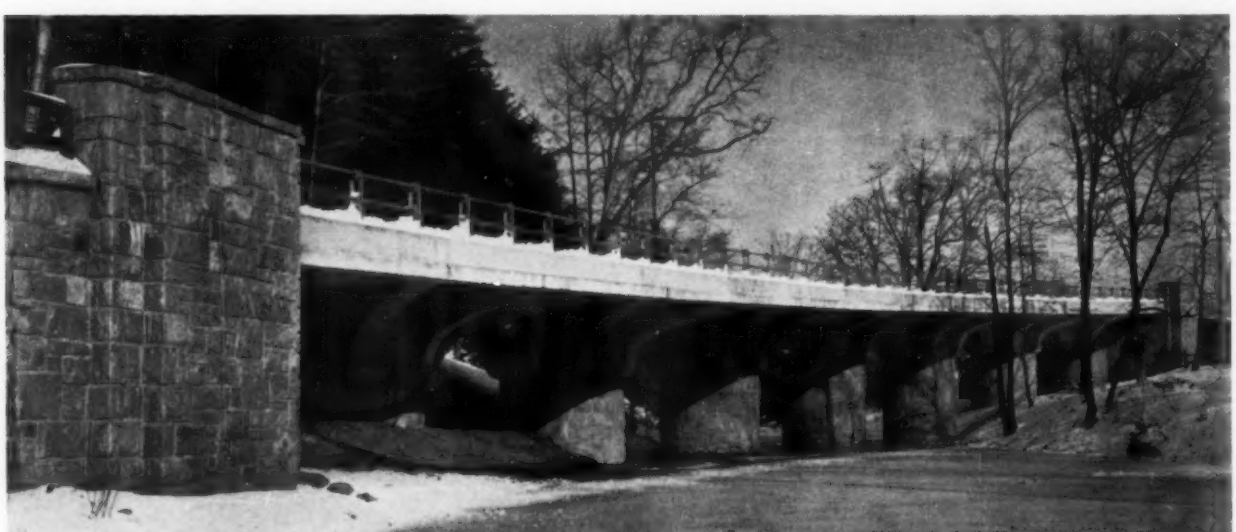



Fig. 6
Steel Girder Design Originally Proposed for Odell Avenue Bridge

approach, are strikingly shown. This rigid frame design was used as the structural parts of several of the bridges shown in this and the accompanying article by Mr. Clarke, and in a number of other bridges not illustrated. Nor should the reinforced concrete structure without stone facing be entirely discarded. There are locations where a properly designed concrete bridge will be found not inharmonious. Fig. 3 shows such a bridge, which was erected in the Bronx River Parkway over the Bronx River and tracks of the New York Central Railroad near White Plains, N. Y. Fig. 4 shows a very economical reinforced concrete design which lends itself to certain forms of arch construction. Steel may also be adapted to certain locations and conditions, as is evidenced by the bridge shown in Fig. 5, which was designed to take the place of a broken-backed girder bridge originally proposed and shown in outline in Fig. 6.

The coöperative spirit under which the Bronx Parkway Commission and Westchester County Park Commission bridges have been designed, and the new structural forms which have been developed by Commission engineers for adaptation to the architectural requirements, have caused widespread discussion, particularly among engineers. Representatives from several state highway departments and railroad companies have visited the Commission's offices to study the methods used so successfully.



Reinforced Concrete Bridge of Unique Design, Bronx River Parkway
Delano & Aldrich, Architects — A. G. Hayden, Designing Engineer

# PLUMBING FOR THE TOWER TYPE OF BUILDING

BY

HAROLD L. ALT

MODERN development in building construction tends toward the planning and erecting of higher structures. Congestion of population, rising real estate values, and the desire for light all combine to make increased heights desirable, and since the plans of a building over 100 stories high were approved by the New York Bureau of Buildings, no doubt of the possibility of making structures of lesser heights entirely stable should exist.

Granting that, with modern steel construction scientifically designed, buildings of from 40 to 80 stories are entirely feasible, the next problem has to do with the proper servicing of such an enormous amount of floor area so high above the street. Elevators to properly serve the upper floors require so much additional space as to seem almost prohibitive; heating lines grow to abnormal sizes, with the expansion increased in proportion to the height; the chimney occupies a gross floor area, owing to the large number of stories through which it must pass, as to seem unreasonable. But the greatest difficulty seems to concern the plumbing. It must be remembered that the plumbing system handles water, and as water is a commodity of considerable weight, difficulties arise in the plumbing which require special treatment. Roof drains, soil stacks and hot and cold water lines are some of the items which cannot be handled in the same manner as in lower structures. Pipes multiply and require space allotment which would be considered out of proportion in lower buildings.

*Plumbing Work.* It is the purpose of this article to point out some of the difficulties encountered with plumbing in the high or "tower" type of building, and to make constructive suggestions in connection with various schemes that have already been worked out for the purpose of overcoming these difficulties. For the purpose of this article the "plumbing," as far as covered, will be considered as consisting of soil, waste and vent stacks, hot and cold water pipes, and roof leaders. Special services, such as compressed air, gas, vacuum cleaning, drinking water, refrigeration, fire lines and so on, cannot be covered in an article of limited length, so these must be left for future consideration. In general, a building in which proper provision has been made for the incorporating of the major services, can have the special services included with only unimportant changes.

*The Soil System.* In providing for water closets in high buildings great care must be taken in arranging the soil piping; this is due, primarily, to the unusual height and to the excessive number of fixtures on a stack. In cities where combined soil and waste stacks are permitted, the load on the stack is increased by whatever number of waste branches drain from each floor. In order to assure the most dependable type of service, soil stacks are run so as to take care of alternate floors. Thus one stack would take the drainage from all the odd numbered floors in the manner illustrated in Fig. 1. In the event of one of these stacks becoming clogged up or having a stoppage occur in the horizontal basement section, only the toilets on alternate floors would be put out of commission, so that occupants by going either up or down one flight of stairs would find facilities in spite of the one stack's being unusable. At the base each stack would be run into a separate house sewer, which would be carried to and connected with different sewers in streets on either side of the building, so that even the temporary blocking of the street sewer or connection between the building and the street would still leave toilets on alternate stories in service.

Soil stacks for the lower portion of the building should be taken care of separately from those serving the higher portions, and the arrangement should be made so that stacks serving the upper portions have no connections of any nature with those in the lower stories, this again operating toward a reduction in stack size and also giving an opportunity for the building of an enormous head behind any stoppage which may occur near the bottom of the stack or in the horizontal run to the street. Setbacks, which usually accompany the tower type of construction, materially aid this arrangement by permitting soil stacks serving the lower portions of the building to be brought out of the lower setback roof and there terminated. Stacks serving the next higher section run through the lower section without openings and serve the portion of the building between the first setback and the next higher; this scheme is followed out until the stacks going to the top of the tower portion are encountered, which stacks serve alternate floors in the tower with no outlets below. This is diagrammatically shown in Fig. 2. It has been found that in tall structures it is not desirable to run soil stacks in a perfectly straight, vertical line, because the water flowing down the stack attains too high a velocity, giving rise to noise. For this reason soil stacks are deliberately offset at points about 10 stories or 15 stories apart, and the flow is thus retarded. Provision for such offsets or changes in direction should be made in the original building design, since otherwise considerable difficulty may be experienced in trying to incorporate them later.

*Waste Stacks.* Waste stacks must be provided where lavatories are to be installed in offices, and these in most cases will follow the structural columns. Considerable floor space may be saved if the installation of these waste stacks is anticipated in laying out the steel frame. It may sound unreasonable to suggest the arrangement of steel framing

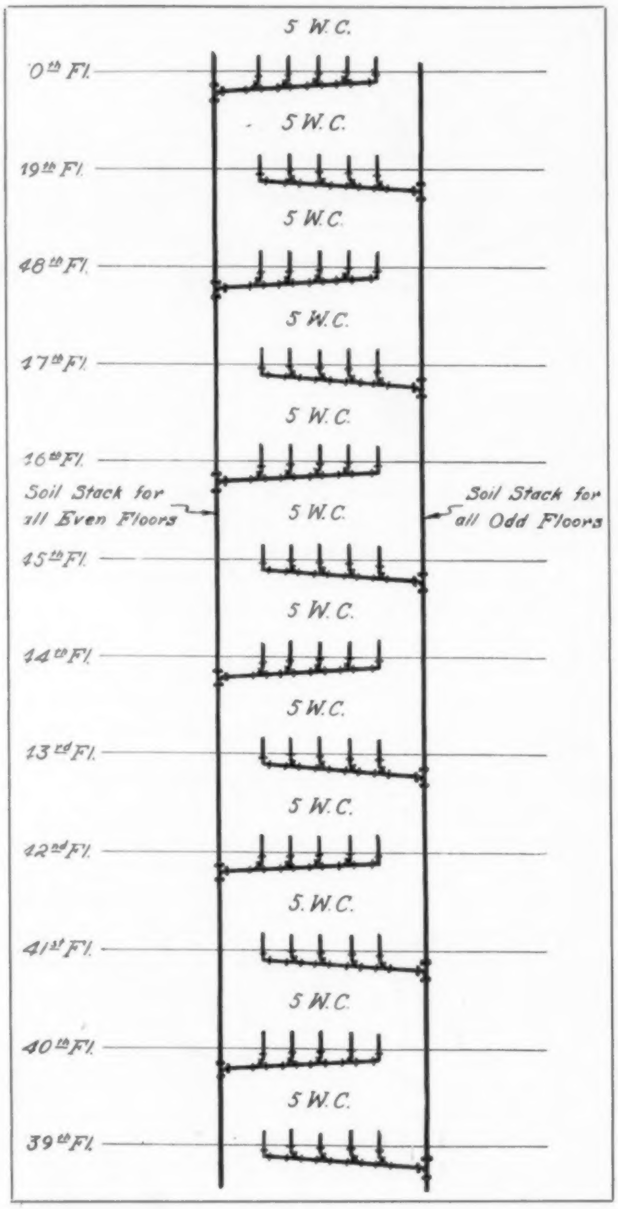



Fig. 1

to suit the plumber's waste pipes, but such has already been done and the space saving is considerable. It is not necessary to make any changes in the structural steel beyond working out a special column connection for beams, so that a small opening is provided on each side of the column in the manner illustrated in Fig. 3. This is commonly termed a "bracket" connection as distinguished from the ordinary "angle" connection shown in Fig. 4. This scheme lends itself very readily to the putting of the waste stack and cold water riser on one side of the column and the vent stack and hot water riser on the other side, as illustrated in Fig. 5. If the ordinary steel framing should be used, about the best that could be done would be as indicated in Fig. 6. The remarks just made about soil stacks apply in less forceful form to the waste stacks; they should not be made over 3 inches in size if possible, and they should serve only certain horizontal sections of the building; they should be offset or shifted from time to time to break the water fall.

*Vent Stacks.* Venting and vent stacks should receive careful attention. Plumbing codes vary so greatly in their venting regulations that it is hard to give any recommendations except to say that in high buildings vent stacks should be installed whether the local code requires their use or not. Where larger sizes are not demanded by ordinance, the vent stack may be safely made somewhat smaller,—a 6-inch soil stack with a 4-inch vent stack or a 4-inch soil stack with a 3-inch vent stack. For waste stacks the same applies, only running to smaller sizes, such as a 4-inch waste stack and 3-inch vent stack, a 3-inch waste stack and a 2½-inch vent stack, or a 2½-inch waste stack and a 2-inch vent stack. There is nothing to be gained in offsetting vent stacks, as there is no water flowing through them. Vent stacks should be parallel the respective soil or waste stacks which they serve, and as soon as the bottom connection on each particular stack is reached, the vent stack should be run back into the stack through a 45° ell and a Y fitting. There is no object in venting soil or waste below the bottom fixture connection, since any air caught below this point cannot blow out in fixtures below (owing to there being no lower connections to the stack), and any retarding effect on the falling water in the stack is really of beneficial character.

*Materials of Construction.* In all high building work, galvanized steel or galvanized wrought iron pipe can be used for waste, soil and vent stacks, this being made up with galvanized, cast iron, screwed recessed, drainage fittings, with all pipe most carefully reamed out. Where lines run underground, extra-heavy, uncoated, cast iron soil pipe and fittings with calked lead and oakum joints should be used. Expansion joints are sometimes used in the vertical risers every 20 stories or less, but difficulty will probably be experienced with the local authorities if any type of slip joint is advocated. A corrugated copper joint with flanged ends and companion flanges can generally be used. There is also a cast iron slip joint which has been approved in some of the large cities.

*Water System.* Furnishing water supply for the building will have an important bearing on the building design, and this is one point on which it is well to be forewarned. It is most essential to keep the water pressures down to a point where excessive splashing and undue wear and tear on the equipment will be avoided. For this reason the building should be divided into horizontal sections or zones of 10 to 15 stories each, and each of the separate zones should have its own individual house tank and hot water heater. The house tanks and hot water heaters for the same zone will not come in the same tank room. In order to obtain satisfactory water pressure on the highest floor of each zone, the tank room for that particular zone should be located in the zone above

and two stories higher. This will result in a pressure head on the fixtures in the top story of the zone equal to that of two stories plus the height of the water line in the tank (which usually is about 25 or 30 feet). The hot water heater for the same zone must be located at the bottom of the zone in order to circulate the zone by gravity.

*Hot Water Systems.* For convenience the hot water heater is usually placed in the tank room of the zone below, and the hot water is fed down one story without circulation, but it circulates to the stories in the portion of the zone above the hot water heater level as usual. This will probably he made a little more clear by referring to Fig. 7, where a typical zone is illustrated with the levels on which the house tank and hot water heater for that zone would be installed. Of course the hot water heaters may be dropped down to the story below the lowest in the zone, which will give hot water circulation to all stories included in the zone without dead ending. This will entail extra heater rooms at certain levels which will not be the same levels as those on which the house tanks are set, so that this arrangement, which is shown in Fig. 8, is usually not as economical in floor space as the scheme shown in Fig. 7.

*Materials for Water Systems.* It is the growing practice to use brass pipe and fittings for both hot and cold water lines in the best class of construction work, and especially when lines cannot be replaced readily. Steel and genuine wrought iron pipe, galvanized, are often installed in the larger sizes, owing to the greater thickness of shell and the rapidly increasing cost of brass as the diameter enlarges. All joints should be screw joints on the smaller sizes and flanged joints on the sizes of 6 inches or over. They should be made up with only red or white lead used as a lubricant on the male thread only, and they should be tested to a pressure 50 per cent in excess of the maximum working pressure. House tanks are invariably steel, usually square or rectangular, and braced with substantial angles; they are built with angle iron curbs, and have ⅛-inch steel covers, made up in sections and suitably stiffened. The house tank construction is similar to that in the building of ordinary height. The same may also be said concerning the hot water heaters; owing to the zoning of the building, the pressure on the heaters is no more than that ordinarily encountered in lower buildings, and the same heaters of proper capacity will give satisfaction in structures of the tower design.

*Hung Ceilings and Pipe Spaces.* It is highly desirable to zone the building for water supply purposes at the earliest possible moment, so as to provide hung ceilings with pipe spaces above for horizontal distribution mains. When such spaces are provided it not only means increased floor heights for those particular stories but also provides the heating system with horizontal distribution space for supply mains and drip lines. With a proper amount of forethought, ceiling spaces and tank rooms may

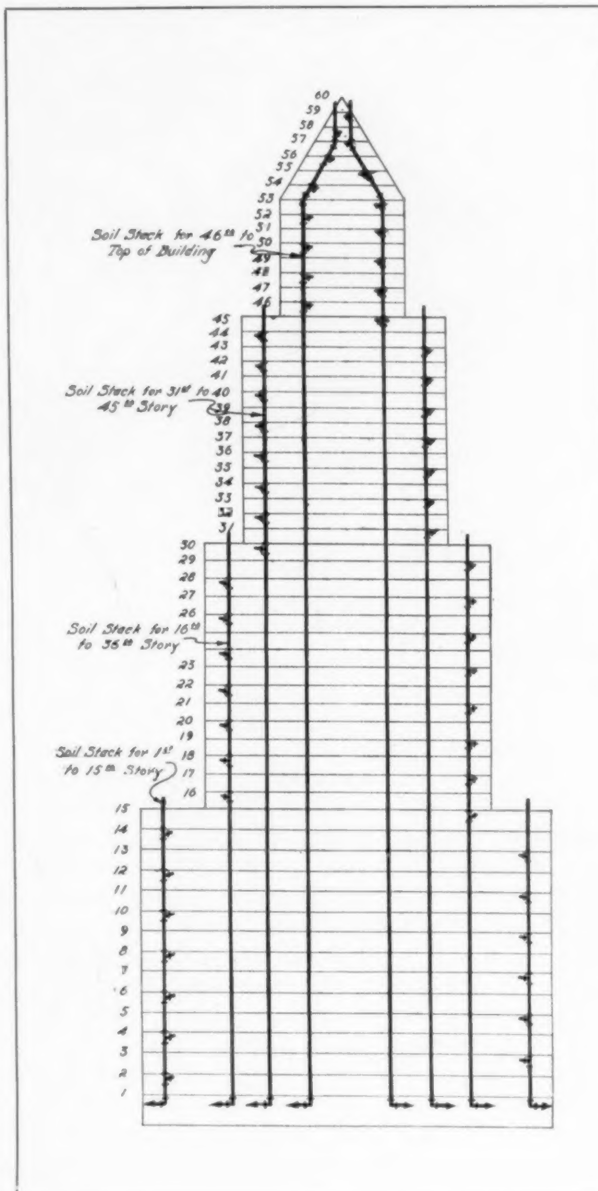



Fig. 2

be arranged so as to dovetail with the hot water and heating arrangement. Through lack of appreciation of certain possibilities in the original designs, most builders fail to take the full advantage possible from the hung ceiling owing to the fact that it is usually attempted to fit in the equipment installation with previously located hung ceilings instead of the hung ceilings being arranged to suit the requirements of the installation.

In Fig. 9 is illustrated an arrangement of hung ceilings so located as to accommodate:

(a) Cold water supply horizontal distribution for each zone.

(b) Hot water supply horizontal distribution for each zone.

(c) Hot water return mains for each zone.

(d) Heating supply and return distribution for each zone.

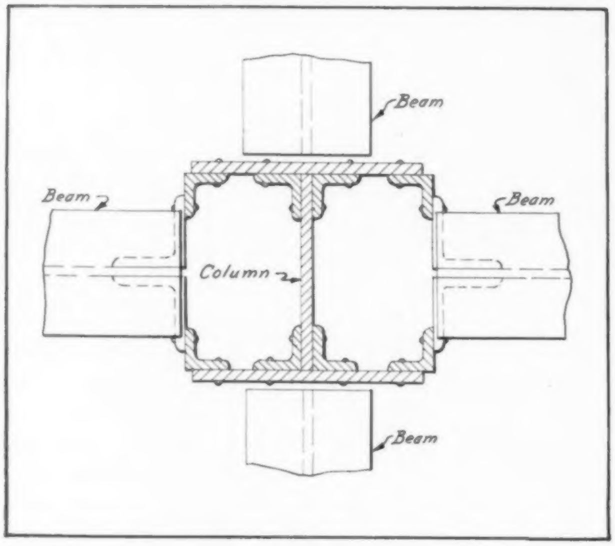



Fig. 3

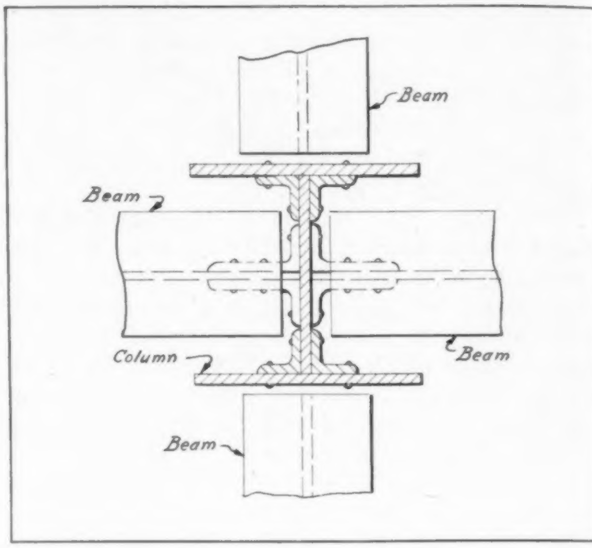



Fig. 4

This is accomplished by placing the hung ceiling over the story just below the tank room and placing the tank room two stories above the particular zone which the tank may serve.

*Pumping to House Tanks.* In the matter of filling these tanks with water for the various zones and the keeping of them filled when each has a different amount of water taken from it each hour in the day, some real difficulties have presented themselves. It is not economical to pump all the water required in the building up to the highest house tank and then let it run down through consecutive tanks with ball cocks until the lowest tank is reached, because this means pumping all of the water to the highest portion of the building when some of it is only required in the lower portions, involving a considerable waste in electric power. Moreover, an extremely high-pressure pump is required to operate against gravity heads of 500 to 1,000 feet, to which must be added the pipe friction. This has led to the adoption of the scheme of locating a pump in each and every tank room. Each pump then uses the tanks in that room as suction tanks and lifts the water from the zone in which the pump is located into the tank of the next zone above; here another pump takes the water from the tank and raises it into the next higher zone. It is self-evident that with such an arrangement the water used in each zone is pumped no higher than the tank supplying that particular zone.

*Pump Capacities and Control.* The capacities of these pumps are carefully graded so that the higher pumps can never dry the lower house tanks, as this would interfere with the water supply for the lower zones. To forestall any such possibility, the capacity of the pumps is steadily reduced from the lowest pump to the highest. Thus, if the basement pump has a capacity of 100 g. p. m., then the pump in the

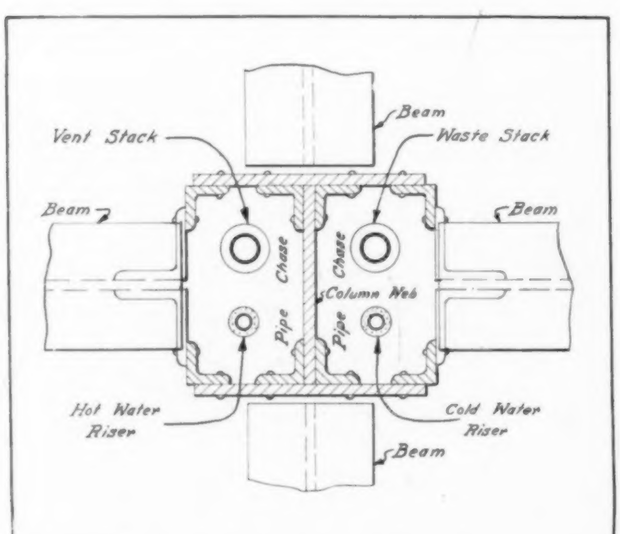



Fig. 5

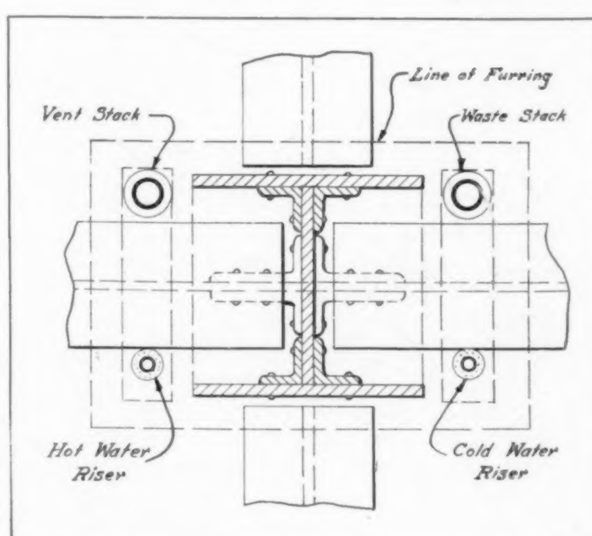



Fig. 6

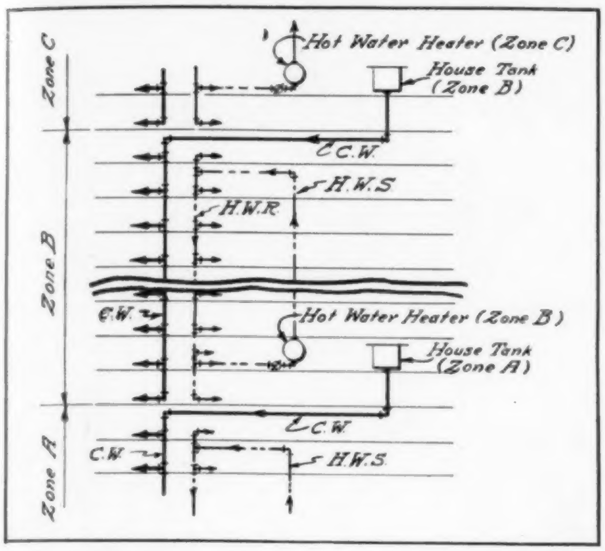



Fig. 7

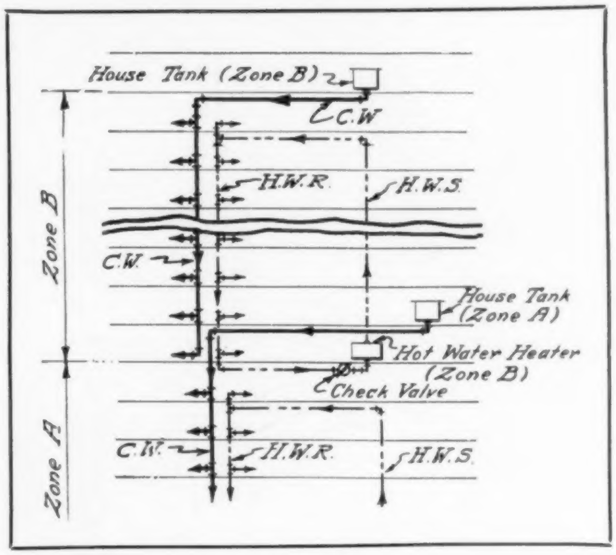



Fig. 8

next higher zone should have a capacity not to exceed 80 g. p. m.; the next higher pump not over 60 g. p. m.; then 40 g. p. m., and so on. Usually the decreasing floor area in the upper sections will quite justify the cutting down of the house pump capacities in the upper zones. Pumps should be installed in duplicate sets with one for reserve and should have float controls from the tanks into which they discharge. The heads on the pumps will be governed by the vertical height and pipe friction as in any pumping installation. Pumps are generally of the centrifugal type, directly connected to motors and set on a common bedplate. Throw-over switches should be provided in the control wiring from the house tanks, so that either pump can be thrown into service as desired.

Roof leaders, owing to the numerous setbacks, occur at frequent intervals in the tower type of building. Here again, hung ceilings should be provided directly under the roofs of the setbacks, not only for leader boxes located in the roof immediately above, but to provide space in which leaders from the roofs above may be offset. The same space will also serve for the heating risers, and so it is doubly useful. In cases where it is intended to carry leaders down the outside, the roofs should be arranged to pitch toward the outer parapet, so as to bring the leader boxes as nearly vertical over the leaders as possible. It frequently happens that space is not available at the window pilasters to accommodate large leader lines as well as the heating risers; the alternative in such cases is to slope the roofs toward the middle of the building and to carry the leaders down in pipe shafts. It is not always advisable to join leaders from upper levels with those of lower roofs until the lower leaders have dropped down a couple of stories so as to have a head of water in the lower leader. There is an old saying that if the roof water can once get into the leader it will *go*. But if leaders are small, or if they are temporarily overloaded by a miniature cloudburst, it is very easy for the flow from the higher roofs to retard the incoming water from the lower roofs if connections are made too near the level of the roof outlets from the lower levels.

There is generally allowed 1 square inch of leader area to every 200 square feet of roof or other drainage area. This is the ratio customarily used in New York. In localities where very heavy rains are experienced, as in Pittsburgh, it is safer to use only 150 square feet or even 100 square feet of roof to 1 square inch of leader area to take care of short but exceedingly heavy rainfalls.

In designing high buildings it is sometimes forgotten that the water caught in setbacks may be increased by rains which do not fall in a truly vertical direction. The maximum amount of water which could be caught on the roof of any setback is governed by the area of the setback roof plus the area of the side of the building from the setback up to the next higher roof when projected at an angle of about 60° from the vertical. Reference to any high building elevation will show that if the rain is assumed to be falling at an inclination of 60° from the horizontal, or 30° from the true vertical direction, the setbacks on one side of the building will not only have to provide for carrying off their own normal rain water but will also receive a certain additional quantity which will strike the side of the building above the setback. This is indicated in Fig. 10, and it will be seen that the area which should be figured for any setback roof with a vertical wall at the back is the projected area of the roof and wall taken at 60° from the horizontal. In horizontal leader lines the sizes may be based on the "flow of sewers," which is given in almost any handbook, or it may be governed by the local plumbing code. In cases of combined roof leader and soil drainage systems it is customary to jump the size of the horizontal leader line one pipe size over that actually required

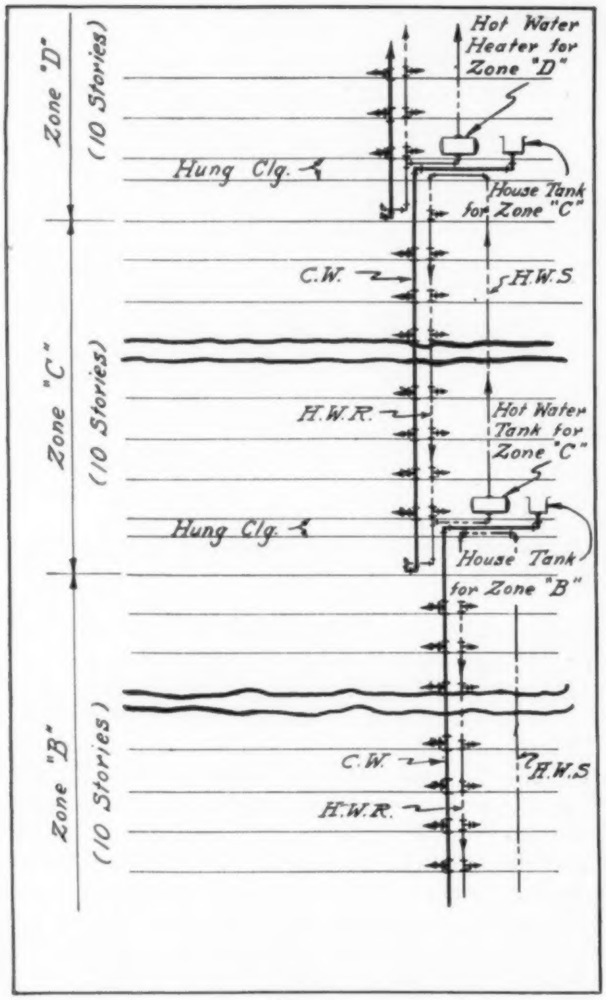



Fig. 9

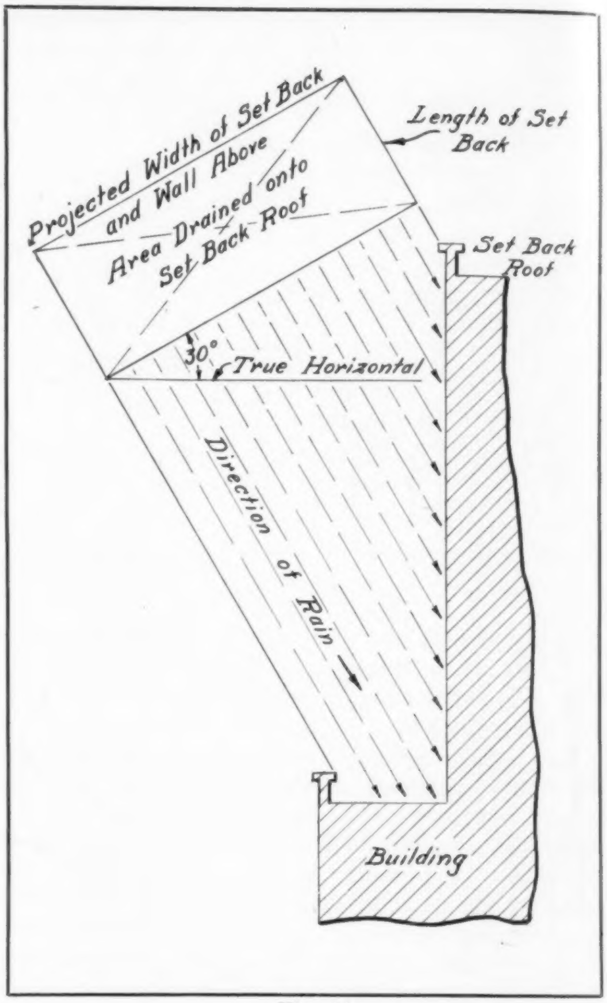



Fig. 10

to carry off the roof water, the extra area being usually more than sufficient to provide the necessary capacity for the soil and waste lines even during heavy rains.

*Snow Melting Pipes.* In vicinities where very low outside temperatures are encountered, snow melting pipes are often utilized. These are for the purpose of melting out the gutters over to the leader box, so that the leaders cannot become clogged with ice even when the combined action of the sun and the building warmth causes the snow on the roof to melt. They are usually made of perforated brass pipe with perhaps ⅛-inch diameter holes on 2-inch to 4-inch centers, and the size of the pipe is made sufficient to supply all the holes with steam at full pressure; the end of the pipe is capped. The pipe is set 2 inches or 3 inches above the bottom of the gutter, with perforations pointing down. These perforated pipes are provided with valves inside the building and should be supplied with steam of at least 10 to 15 pounds gauge pressure. The ordinary heating system steam will usually not have sufficient pressure to satisfactorily operate these lines.

It is often necessary to make a steam connection to the leader just below the leader box so as to heat the leader pipe near the top as well as to thaw out the roof outlet. Unless this is done the action of the whole scheme may be prevented. These snow melting pipes and their cost of installation do not reach as high a figure as might be at first supposed; they have not returns to consider, and each roof,—or even each part of each roof,—may be thawed consecutively so that the risers are never carrying a very heavy load. Probably a 2-inch or 3-inch main steam pipe riser would be sufficient for any high building whose ground area does not exceed 200 x 300 feet.

# A NEW WAY TO DETERMINE ECHOES

BY
R. F. NORRIS
ACOUSTICAL ENGINEER

TO determine the proper period of reverberation for given auditoriums is not difficult, nor is making an estimate of the proper amount of sound-absorbent material necessary to obtain the desired acoustical results. This phase of the subject of acoustics has been clarified. With patience and care, the proper period of reverberation of echo in a room may be determined from formulæ, and an acoustical correction may be computed.

Sometimes, after the proper period of reverberation in an auditorium has been ascertained, one finds places in the room where it is extremely difficult to hear. These places are usually called "dead" spots and are caused by the concentration of reflected sound that is out of phase with the direct sound by one-thirtieth of a second or more. To get rid of these spots, one must find the reflecting surfaces which cause them, then change the shapes of the surfaces or treat them with enough sound-absorbent material to eliminate the disturbing reflections. Several methods have been employed for the detection of "dead spots." An ingenious plan developed by Prof. F. R. Watson of the University of Illinois uses an arc light at the focus of a parabolic reflector. A beam of light is cast and a hissing sound emitted simultaneously by this instrument. The apparatus may be set up on the stage of the auditorium to be tested, and the beam of light directed against any portion of the room's interior. By placing mirrors on the surfaces against which the beam of light is directed, the path of the light after it is reflected may be noted. A sound is reflected in much the same manner as a light beam. In an auditorium being thus tested, the sound may be heard distinctly if the ear is moved into the path of the beam of light. By careful and assiduous manipulation of this apparatus, a thorough survey can be made of any auditorium, its "dead spots" plotted, and the surfaces which cause them determined. Then one may either change these surfaces in shape or pad them with a sound-absorbent material to eliminate the cause of the disturbance.

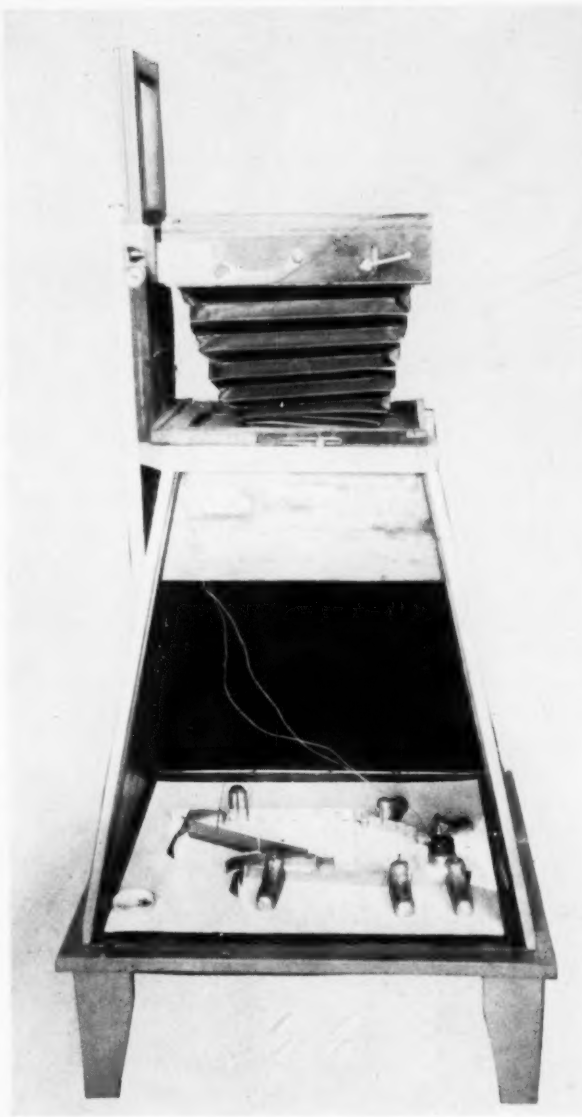


Fig. 1
Camera Mounted Above Section of an Auditorium, as Used in Studying Echoes

Another method, developed by Dr. Paul Sabine of the Riverbank Laboratories, involves making the model of a cross section of the auditorium to be studied, and the production of a very intense, single-sound wave at the spot where the speaker stands. This sound wave is then photographed. The machine may be timed so as to photograph the sound wave at any increment of time after it has left the source. In this way, a series of photographs may be taken, each one showing the spherical sound wave as a ring, expanding away from the source. With a succession of these photographs, the progress of the wave may be noted, its reflection from the various surfaces studied, and the disturbing surfaces determined. A third way of studying an auditorium in regard to its echo-producing surfaces is to lay out the significant sections of the room, then in each section take the speaker's location as a source, and draw lines or rays out to all the boundaries of the section from this point. The rays are assumed to reflect at an angle which is equal to their angle of incidence, and are reflected into the auditorium. These rays then show the paths in which sound travels after its first reflection. If a great number of these rays are accurately drawn, and the angles of incidence and re-

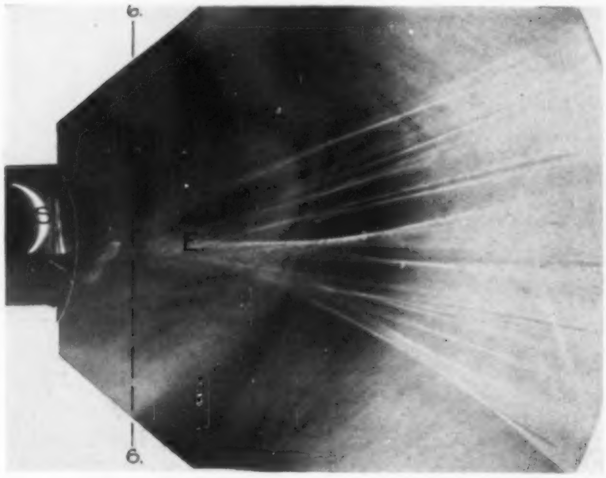


Fig. 2
Photograph of Plan Section of Uncorrected Auditorium Showing Sound Focus at E

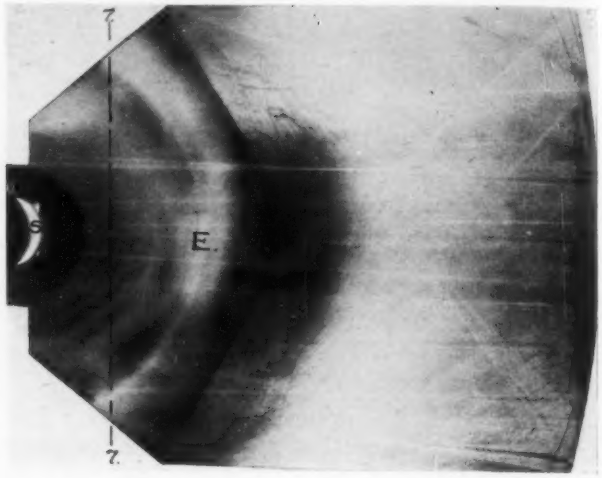


Fig. 3
Photograph of Plan Section of Corrected Auditorium Showing No Sound Focus

flection carefully measured, the resulting picture gives a fair idea of how the sound acts.

Of the methods mentioned, the first is applicable only to auditoriums which have been erected; it cannot be used on the sketches of proposed auditoriums. The models employed by the second method may be made from the architects' sketches of the room, but this method is laborious and time-consuming, due to the necessity of building plaster models of the various cross sections of the auditorium to be studied, and because carefully timed photographs are essential. The third method is applicable to auditoriums of which the plans are available, and it can be utilized in the case of buildings which are only in the sketch state. It had previously been employed by the Burgess Laboratories in making acoustical analyses of rooms before the buildings had been erected, or even fully designed. This method consumes so much time, however, that an accurate short cut was sought.

The significant sections of a room to be studied are usually: (1) the floor plan, (2) longitudinal section, (3) cross sections. They are laid out in line on a stiff white paper (Fig. 1). The section to be studied first is placed on a flat surface, and a highly polished strip made of metal ½-inch wide is placed along the boundary lines of the section, the width (the ½-inch dimension) being perpendicular to the plane of the section. This strip is bent to conform to the outline of the section, and is held in place by weights similar to spline weights. The section is then placed in a darkened room and a small bulb situated at the source of sound is lighted. The reflections from the polished metallic strip are found to make the same pattern on the surface of the paper as would be obtained if one should carefully construct lines representing all the rays of light from the same point and from the reflecting surfaces. This method gives results more accurate than those secured by drafting, and in a fraction of the time required for that method.

Although sound is reflected in the same manner as is light, sound is of such a long wave length in comparison to light that it is much more easily dispersed. Consequently, the engineers studied with extreme care this detail in their method of analysis, since light was employed in place of sound. Under the older method, where the rays of sound were laid out on the drafting board, they were laid out as rays, and no provision was made to correct for the dispersion of the sound. The new method is more accurate than the old, because the likelihood of there being drafting room errors in working out all angles of incidence and reflection is eliminated.

Several auditoriums were laid out and thoroughly studied by the old drafting table method. Small models were then set up with the reflecting walls, using an electric light at the speaker's position. The resulting patterns cast on the paper were found to coincide almost exactly with the patterns obtained from the drafting method. It was only necessary, then, to devise some way of making a record of the light patterns which were cast in the auditorium sections. This was done at first by setting up the sections on photographic paper in a darkened room. The bulb was placed at the desired position and lighted. The intensity of the light is greater where the light is reflected from the walls in addition to the general lighting, so that paper is exposed more at these places, and a shadow picture of the reflections is obtained. In studying the effects of the reflected sound, pegs or pins inserted at different points along the floor and balcony of the auditorium (in the cross section at points in which auditors would be stationed) proved to be exceedingly helpful. These pegs cast shadows which pointed directly away from the surfaces from which the light was being reflected. By reversing the direction and following these shadows, each surface causing a shadow was found. If the distance from the source of the sound to any one of the surfaces and then onward to the listener were greater than the direct distance from

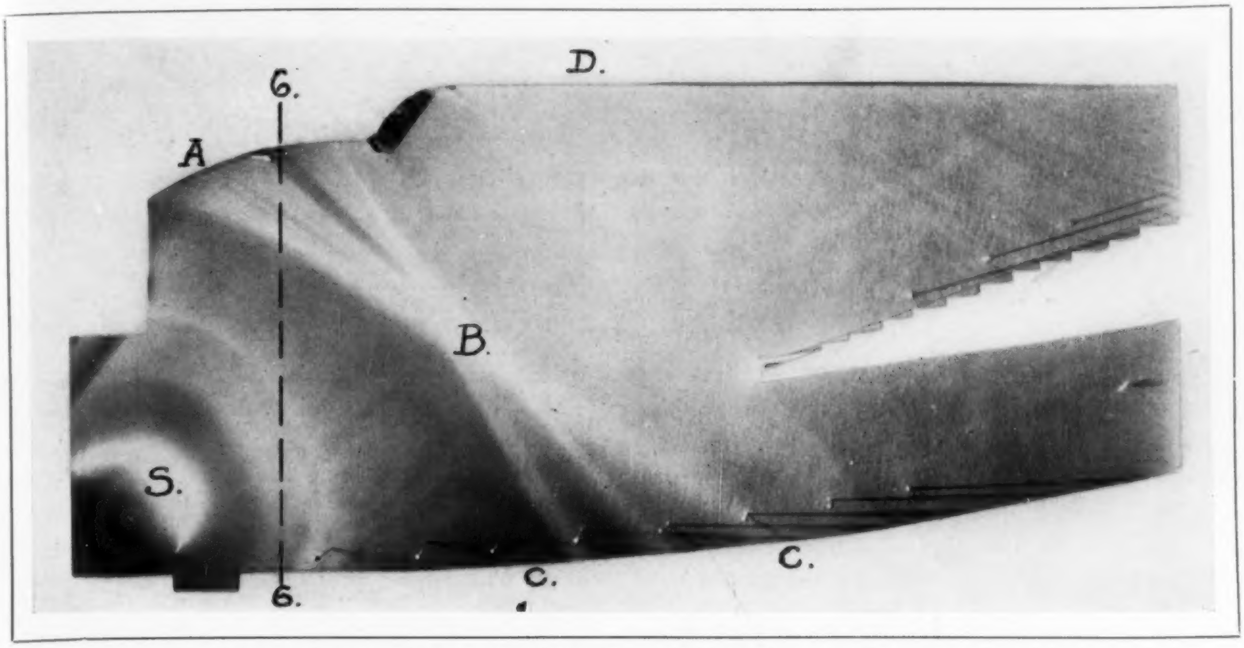



Fig. 4. Longitudinal Section Through Auditorium Showing Echoes at C-C

the source to the auditor, a confusion of the sound would be heard. If the difference in the two paths were more than 70 feet, an echo would be heard; if it were less than 70 feet but more than 35 feet, a blurring effect would make it hard for auditors to understand the speaker.

Referring to Fig. 2, which is the plan view of an auditorium, it will be seen that, with a source at S on the stage, there is a reflection from each side wall toward the center of the room, and that there is a reflection from the rear wall which concentrates at E. The reflections from the side walls are everywhere divergent and do not come to a focus. For this reason, the intensity of this reflection to any single auditor is small, and in all probability would cause no disturbance. Investigations in actual rooms have proved this to be the case. The concentrated reflections at E, however, produce an irritating conflict of sound waves in this region. The reason for this is that practically all of the reflected sound from the rear wall is concentrated in this area, and the intensity of the reflected sound here may be greater than that of the direct sound. In Fig. 3 the curvature of the rear wall has been changed, with the result that all of the concentration at E is eliminated. The sound from the source at S is now reflected in paral-

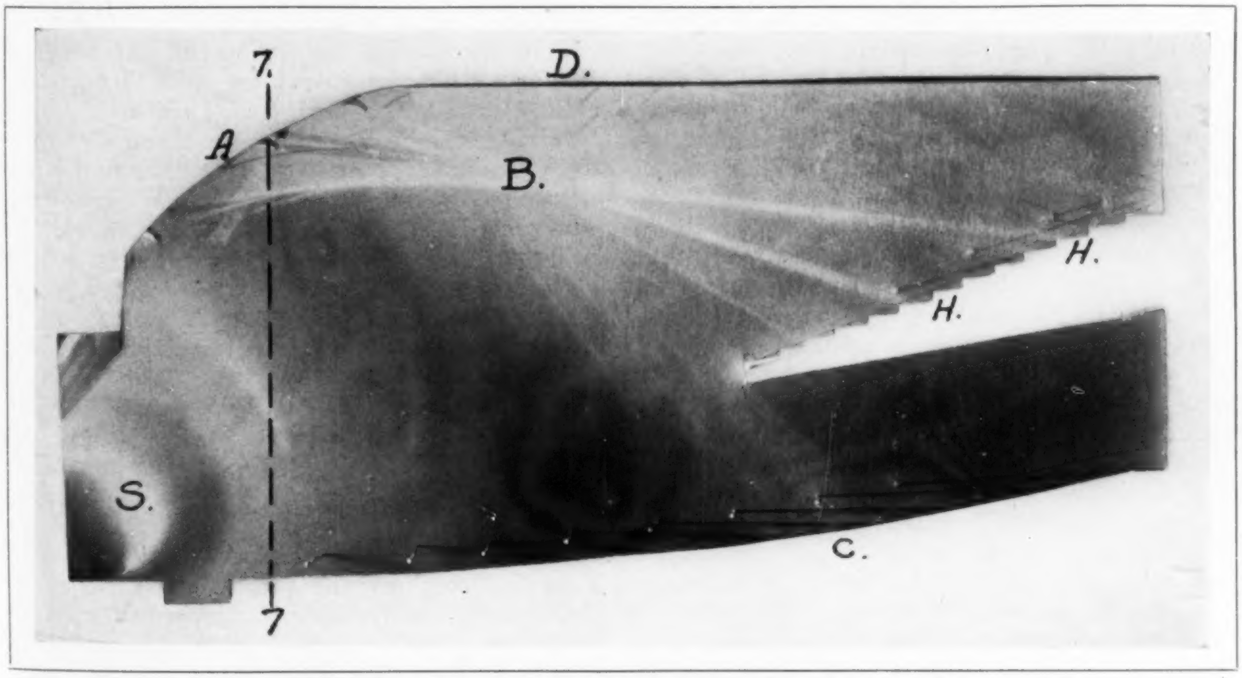



Fig. 5. Longitudinal Section Through Auditorium Showing Elimination of Echoes and Sound Reinforced in Balcony

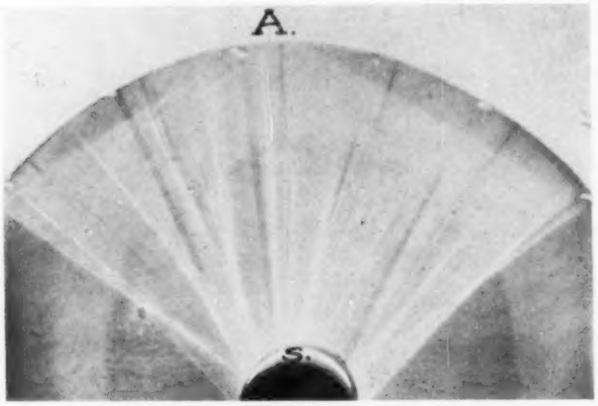



Fig. 6

Transverse Section Through Auditorium Showing Concentration of Sound Due to Ceiling Curvature

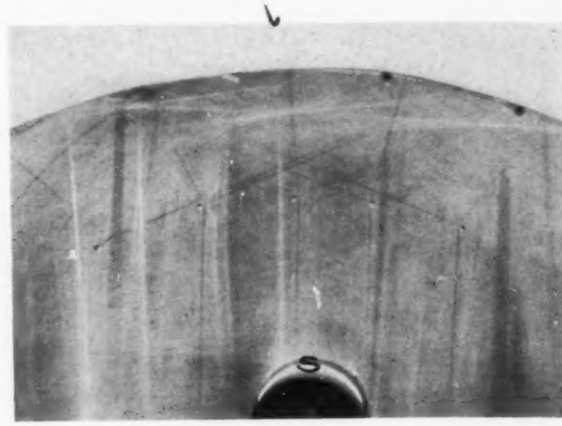



Fig. 7

Transverse Section Through Auditorium Showing Changed Curvature Eliminating Sound Concentrations

lel lines, and the intensity of the reflection at any given point is small. A wall of this type produces no disturbing echo. From these two figures, it is easily seen that the curvature of the rear wall should not be greater than that shown in Fig. 3.

The next two diagrams, Fig. 4 and Fig. 5, show longitudinal sections of the auditorium. Fig. 4 shows the auditorium as originally designed. The ceiling surface nearest the proscenium arch is curved in both directions, and the main part of the ceiling is flat. When this section was set up for study, the reflections from this first ceiling surface A, with the sound source at S, showed a decided concentration of sound at B. This sound then diverged and covered an area (C-C) at the floor level. In this section pegs were inserted along the floor and balcony surfaces to simulate auditors. The fourth, fifth, and sixth pegs from the stage cast two shadows. One, when prolonged past the peg, intersected the source; the other, similarly prolonged, touched a portion of the ceiling surface A. Lines drawn from the source to the points where these prolonged shadows intersect this ceiling surface would properly represent the path of the sound. Since these sections were made to a definite scale, the distance traveled by the direct sound and that traveled by the reflected sound could be accurately measured. If the difference in these distances is more than 35 feet, acoustical trouble over the area C-C occurs. It will be noted that the seventh peg from the stage also casts two shadows. The secondary shadow, when projected through the pin, intersects the ceiling surface D, which is flat. For this reason, as in the case of the floor plan, the reflected sound does not come to a focus, but is everywhere divergent, and is so dispersed when it reaches the auditor as to cause no troublesome echo or blurring.

In Fig. 5 the ceiling surface A has been changed. The curve has been started lower at the stage, and has been run to meet the surface D. The reflections from this surface are not directed into the main floor of the auditorium as they are in Fig. 4, but are thrown back into the balcony, striking the area H-H. The pegs along this area now cast double shadows, one of which when prolonged from the peg passes through the source. The second intersects the ceiling surface A. Again, if lines are drawn from the source to these points of intersection, the paths of the direct sound and reflected sound may be measured. It will generally be found that in a case of this kind, the difference between the two paths is relatively small,—less than 35 feet,—and that the reflected sound acts as a reinforcement of the direct sound, and improves audition in the balcony seats. Notice that the reflection indicated at C is unchanged, but as before said, this reflection is from the flat ceiling surface D, and has no bad effect on audition at this point.

Fig. 6 and Fig. 7 show transverse sections through the auditorium at the line 6-6 in Fig. 2 and Fig. 4, and at line 7-7 in Fig. 3 and Fig. 5. In Fig. 6 the transverse curvature of the ceiling surface A is great. The effect of this is that the sound is concentrated toward the center of the auditorium. A concentration in this direction aggravates the disturbance, due to this surface. Even when the longitudinal curvature of this surface is changed to throw the reflections into the balcony, a surface having this pronounced curvature is certain to cause a concentration of reflected sounds in the middle of the balcony, and this will be distinctly uncomfortable to auditors there. When this curvature is changed, as it is in Fig. 7, the reflected sound travels in practically parallel rays which tend to distribute the sound evenly over the balcony surface. The apparatus used at the Burgess Laboratories to make this diagnosis of acoustical defects is shown in Fig. 1. This illustration shows a cross section of an auditorium erected for study. When laid out in miniature in this way, the auditorium may be studied directly by observing the reflections from the different surfaces. These surfaces may be quickly and conveniently changed, and the resulting change in pattern is instantaneously seen. If a record of any one set-up is desired, the open side of the box is closed and a photograph is taken, camera mounted above model.

# HEATING AND VENTILATING FOR THE ARCHITECT

BY

PERRY WEST

CONSULTING HEATING AND VENTILATING ENGINEER

*Editor's Note.* In this article Mr. West takes up the practical standards in regard to temperature, humidity and air motion requirements. He considers the questions of artificial ventilation; the ways of determining whether or not such ventilation is necessary and, if so, the character of the ventilation to be provided; and air conditioning. The first article of this series by Mr. West appeared in THE ARCHITECTURAL FORUM for April, 1928, Part Two.

CONSIDERING the matter offhand, the heating of a building is a simple problem, but when thoroughly analyzed it is found to present a number of interesting sides which are well worth the consideration of the careful designer. Good heating consists in the maintenance of comfortable temperatures throughout the occupied spaces of any building, an economical "process temperature" where required in manufacturing buildings, and enough heat elsewhere in all classes of buildings to prevent freezing of pipes, etc. An important consideration in any of these cases is the maintenance of the required temperature where it is needed, with as little waste as possible in the adjacent spaces where heat is not required. This is of importance in all kinds of buildings, but especially where heat may be required at or near the floor, where because of the natural tendency of heated air to rise, there may be a high degree of overheating in the upper spaces, with much unnecessary loss of heat through the upper walls and roof. Heat may be required in certain parts of a space only. In such cases the problem is to control the heat so as to establish the required conditions where needed and waste as little heat elsewhere as possible. Recent research has shown that much economy may be had by confining the heat to the 6-foot height of rooms, thereby preventing the usual difference of about 1½° Fahr. per foot in height between the floor and ceiling. This difference may be reduced to about 2/10° Fahr. with some of the newer types of radiators or concealed heaters. This may mean a saving of 40 per cent in extreme cases, and something over 10 per cent ordinarily.

*Theory of Heating Standards.* When we speak of the "temperature," we generally refer to the "dry bulb" temperature. This measure of temperature is of little value for determining the conditions of comfort for human beings or the proper atmospheric conditions for the processes of manufacture. Recent research at the American Society of Heating and Ventilating Engineers' Research Laboratory, operating in conjunction with the United States Bureau of Mines and the United States Bureau of Public Health, has shown that there are three important factors which go to make up the effective temperature, or the physiological temperature effect which atmosphere will exert upon human beings. These are *dry bulb* temperature, *wet bulb* temperature, and *air* motion; on them our comfort depends.

The *dry bulb temperature* is that taken with an ordinary thermometer (usually reading in Fahrenheit degrees), and this represents the temperature of the air without reference to the effect of its moisture content.

The *wet bulb temperature* is that taken with a similar thermometer, which has its bulb encased in a silk mesh bag; the reading being taken after the bag has been moistened with clean water and the instrument has been whirled through the air until the indication has become stable. This wet bulb temperature takes into account the conditions of the atmosphere as to its moisture content, due to the fact that the rate of evaporation of the moisture from the bag and the consequent cooling of the thermometer bulb, caused by this evaporation, depend upon the relative amount of moisture in the air.

By *air motion* is meant the velocity of the air in feet per minute. Its effect is that of a breeze, in removing the enveloping air and bringing new air to take its place, thus producing a cooling effect by increasing evaporation.

The combined effect of these three factors is designated as the effective temperature. An idea of the relative importance of these factors may be gained by taking an ordinary dry bulb temperature of 70° and considering that there is an effective temperature of 60° when the air is absolutely dry and without motion, an effective temperature of 50° when dry and with an air motion of 500 feet per minute, and an effective temperature of 70° when fully saturated and without air motion. These factors have a similar bearing upon the effect that an atmosphere will have upon processes or products of manufacture. They affect the drying, cooling, heating, expanding, contracting, hydrating, dehydrating, cracking, warping, sweating and other effects and variations which any particular or varying atmospheric conditions may exert upon the product.

The effective temperature, not the dry bulb temperature or the wet bulb temperature, or both without the consideration of air motion, determines the heating requirements as far as the health, comfort and efficiency of workers or the quantity and quality of products of manufacturers are concerned. The exact physiological effect of these factors has been established by the American Society of Heating and Ventilating Engineers' Research Laboratory, as illustrated by the accompanying chart shown in Fig. 1. This shows the effective temperature chart for human beings at rest in still air with different dry bulb and wet bulb temperatures corresponding to different percentages of relative humidity, or moisture in the atmosphere. The relative humidity is

calculated from the difference between the wet and dry bulb readings. This chart is made up of vertical isothermal lines representing the dry bulb temperature, as shown on the horizontal scale at the bottom; horizontal lines, representing the grains of moisture per pound of dry air as shown on the vertical scale at the left; light oblique isothermal lines sloping downward toward the right, representing the wet bulb temperatures as shown in the scale along the upper curved line; heavy oblique effective temperature lines, representing the effective temperatures as shown on the same scale as the wet bulb temperatures; and the oblique curved lines, representing the relative humidity in percentages of the quantity of moisture required to saturate air at the particular dry bulb temperature under consideration. The shaded section between the effective temperatures of 62° and 69° covers the conditions of substantially equal human comfort and is designated as the "comfort zone." The effective temperature of 64° is the optimum for the average human being at rest in still air, and is designated as the "comfort line."

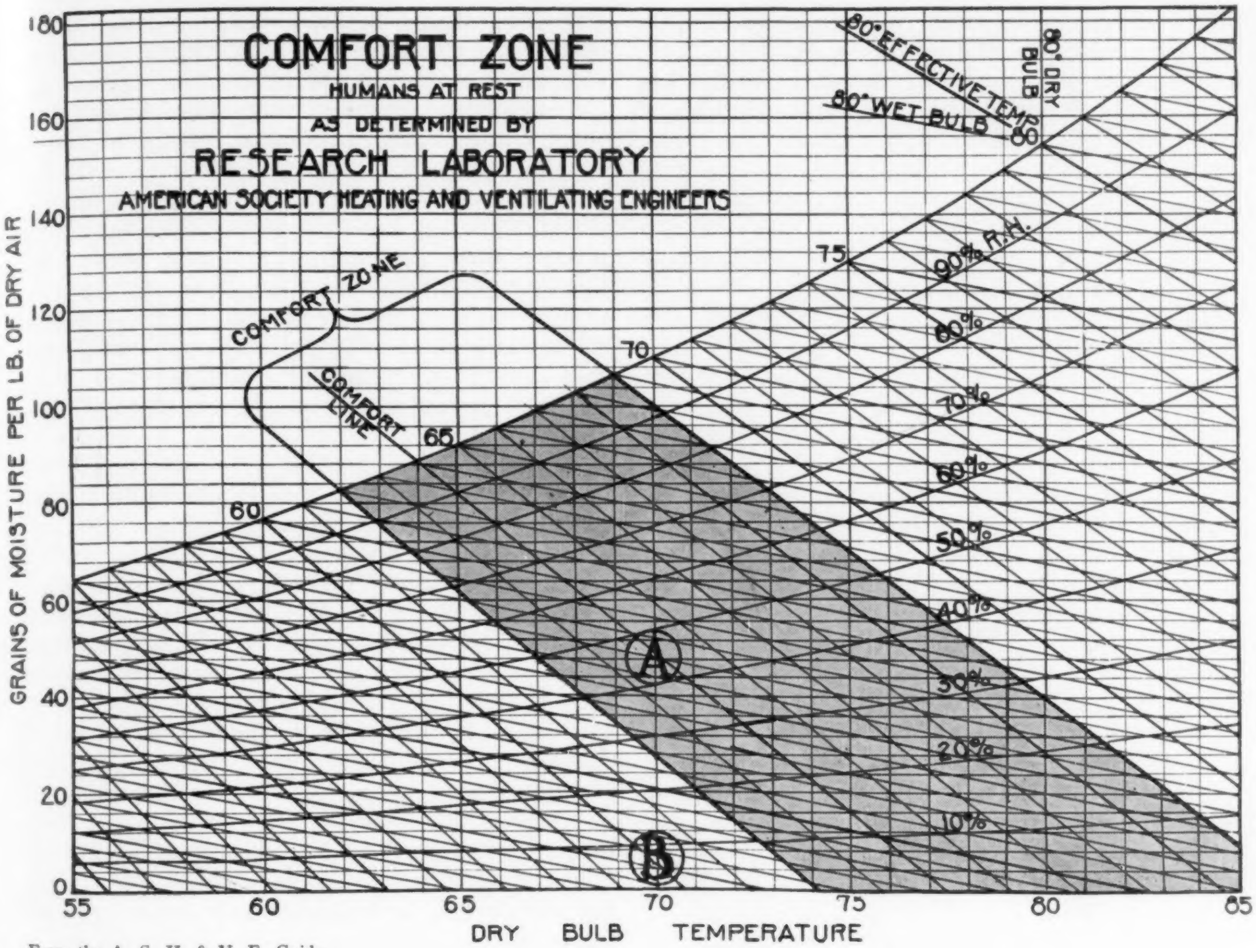
To use this chart, start with the dry bulb temperature, for example, of 70°, at (A) and follow the vertical line to its point of intersection with the wet bulb temperature, say of 57°, at (B). The curved line passing through this point of intersection will represent the relative humidity, which in this case happens to be 45 per cent. Starting from (B) a line drawn parallel to the nearest effective temperature line to the scale of effective temperature will intersect this scale at the effective temperature reading, which happens to be 64° in this case. Starting again from (B), a horizontal line will intersect the scale of moisture contents at the number of grains per cubic foot of air, or 44°. Similarly, by starting with any two known factors, the other may be found. The example represents the optimum effective temperature condition for a dry bulb temperature of 70°. It will be seen that for this dry bulb temperature the moisture contents may be varied between 24 and 100 grains per cubic foot, corresponding to a variation from 28 to 92 per cent of relative humidity, and an effective temperature variation from 62 to 69 degrees, without getting outside the comfort zone in either direction.

It should be borne in mind, however, that this comfort zone covers the extreme limits for health and comfort, and that the nearer the conditions are kept to the comfort line the more ideal they will be. It should be noted that around 70° dry bulb the allowable variation in humidity is greater than at temperatures far below or above. Also the dryer the air the hotter it must be, and the more moist the air the cooler it must be, in order to produce the proper degree of comfort. It should be noted in connection with air motion that a dry bulb temperature of 76½° with 150 feet per minute air motion, and 82½° with 500 feet per minute air motion, are required to meet the comfort line requirements of 70° without air motion, with 45 per cent relative humidity in each case. Also that the widest allowable variation in humidity is near these temperatures.

There are conditions, therefore, under which moisture in the air assists the cooling effect of air movements, and other conditions under which it retards it. This is why the wind makes one feel colder on a cold, damp winter day and hotter on a hot, damp summer day. So far we have discussed the conditions pertaining to human beings at rest. For those actively engaged in work, there is considerable variation from these conditions of comfort, depending upon the character of the work. These conditions have not been very accurately determined as yet, but present indications are that for human beings at hard work the effective temperature may be reduced at least 5 degrees, as far as health and comfort are concerned. Some recent studies throughout the industries indicate that male workers show best results at a temperature of 72° and a relative humidity of 40 per cent, and female workers at 80° and a corresponding lower relative humidity, with both conditions corresponding to an effective temperature of about 65°.

It has long been known that overheating is very enervating and greatly lowers the capacity of workers, but this condition cannot be diagnosed from the dry bulb temperature alone. If the humidity is decreased in proportion, the temperature may frequently be increased with advantage, as shown by these studies. Studies of the New York Commission on Ventilation indicated that the capacity of workers is reduced about 28 per cent with a temperature of 78° and a high relative humidity as compared with a temperature of 68° and a low relative humidity. This report is not definite, but the higher temperature and humidity would probably correspond to an effective temperature of 75° and the lower conditions to about 63°. It is fairly safe to say that an increase of each degree in effective temperature will decrease the capacity of workers about 2½ per cent. These studies are being further carried out, and more definite results will be forthcoming, but it can be seen that the data already available are very useful if properly understood and applied. The reason that the data on proper standards of heating are not more definite is that the physiological reactions upon human beings are so different and indefinite that a great amount of very careful and laborious research is necessary to determine the exact conditions of comfort, and vastly more to determine the effects on health, efficiency and longevity. In the effects upon processes and products, the determinations are much easier and the available data much more exact. For this reason it is sometimes found that better heating and ventilating conditions are maintained for making chewing gum, candy, tobacco, textiles and other products of manufacture than for the employes working in the factories producing them.

*Practical Heating Standards.* The proper standards for heating comfort where the occupants are




From the A. S. H. & V. E. Guide

Fig. 1. Chart Showing Relations of Temperatures and Humidity to Comfort

not engaged in manual labor, is from 62° to 69°, with an optimum of 64° effective temperature, but as already pointed out, the dry bulb temperature necessary to produce these results may be varied from 62° to 90°, depending upon the relative humidity and air motion. Optimum conditions for all of these factors are perhaps around 70° dry bulb, 45 per cent relative humidity, with a light air motion. Where occupants are performing light work, the dry bulb temperature may be reduced to 67½°, and where performing heavy work to 65° with 60° as the low limit. Departures from these standards will represent a loss in comfort and efficiency of about 2½ per cent per degree.

In producing these results it is necesary to take into account not only the heat to be supplied by the heating and ventilating equipment, but the body heat given up by the occupants themselves, as well as the heat given off by the lighting, motors and other equipment, and these must be properly balanced against the heat losses from the building. In special cases where furnaces or other large heat-emitting sources are present, it is important to know the exact physiological effects which these will produce on the occupants, as it sometimes involves a problem of cooling by air motion or other means to prevent overheating at these points, and at the same time maintain sufficient heat elsewhere in the room. The Kata thermometer, which is an instrument which can be held at body temperature and at the same time record the rate of heating or cooling effect of surroundings, is used to determine the conditions to be met in such cases.

*Kinds of Heating Apparatus to Use.* Cast iron boilers are desirable for residences or small buildings, or even for larger buildings where low pressures are carried and load fluctuations are small. They have the advantage of high resistance to corrosion, ease of rigging to the point of erection, flexibility in the addition or replacement of sections, low first cost, and small space requirements. Steel boilers of the fire-box or self-contained types are desirable for larger buildings with fluctuating loads and higher pressures, and have larger water and steam storage capacity, great tensile strength, freedom from cracking, high economy, quick response and capability of being forced. Water tube boilers are desirable for high-pressure plants where large capacity must be gotten into small floor space and where the duty is heavy and continuous, loads fluctuating, and extreme safety an important item.

The use of oil fuel is largely a matter of choice

and opinion with the owner. Generally speaking, it is cleaner and requires less labor than coal, is more easily stored, and requires less space. It is not a panacea for all fuel troubles, as oil burners depend on electrically or steam-driven machinery which must be kept in repair and is subject to many difficulties if not properly installed, understood and taken care of. Here again the psychology of the situation should be well considered, and use of oil should not be forced on unwilling owners or operators, as it takes good will, good service and good operation to make it successful. In residences, schools and small buildings generally, where expert operating organizations are not in charge, the lighter oils which are subject to automatic control should be used. The cost of heating with oil at about 10 cents per gallon is equivalent to that with $15 coal. The cost of the apparatus will add from 20 to 50 per cent to the cost of the heating system, most of which is offset by the saving of space, especially in larger buildings. In larger structures heavy oil may be used at from 4 to 5 cents per gallon, which is equivalent in cost to heating with coal at from $6 to $8 per ton.

Gas fuel is very satisfactory; requires little space; is entirely free from dirt and labor; and susceptible to ready automatic control. Its cost with the ordinary heating system and at $1 per 1000 cubic feet of 500 B. t. u. gas, is equivalent to that with $32 coal.

Concealing radiation in recesses or cabinets is being done to a great extent, but care should be taken to see that this is done so as not to interfere with proper heating (see pages 77 and 78 of the American Society of Heating and Ventilating Engineers' Guide, 1928). Concealed and cabinet radiators are fast coming to the front and are very effective and economical, but have hardly been in use long enough to determine the effect of dust and lint collecting between the fins, or to demonstrate as to how they stand up otherwise after long usage. Radiation with a preponderant radiant factor as compared with ordinary radiators which operate largely on the convection principle, has recently been developed. It is claimed that this new type gives the same degree of comfort in the lower parts of small rooms as the other types of radiation, but with appreciably less heat input. It is interesting to note that the concealed or cabinet radiators tend to accomplish the same purpose by causing a more rapid and extensive circulation of air in the lower portions of small rooms to and from the radiator, thus reducing the overheating of the air in the upper parts and reducing the heat loss. These new developments seem to be along the right lines. Their tendency is toward more efficient heating with much better opportunity for artistic treatment than afforded by the architect's old enemy,—the radiator.

*The Ventilating Problem.* Ventilation perfection is a very definite thing, and may be thus defined: that atmospheric condition in every part of indoor space occupied by human beings which is continually maintained with a proper amount of oxygen; free from dust, bacteria, objectionable odors; poisonous and other objectionable substances; with suitable air movements, and at the temperature and humidity condition within the zone of human comfort as scientifically determined. Good ventilation may be considered as that percentage of perfection of these factors which is warranted by the requirements of human health, comfort and efficiency on the one hand, and expense and labor to produce these conditions (whenever they do not naturally exist) on the other. In the popular mind the general subject of the theory and practice of ventilation is in a state of complete flux. There is, however, a very rapid crystallization toward very definite standards and practices.

*Is Ventilation Necessary?* The answer to this depends upon the particular requirements for the space in question, but generally speaking, any space within which the atmospheric conditions cannot be naturally maintained within the range of comfort can well be given the best mechanical ventilation devisable. It is no longer felt that the chemical composition of the air is the important factor, but that proper ventilation depends more largely upon a number of other factors which are given here in approximately the order of their importance:

1. Air supply.
2. Air temperature.
3. Air cleanliness in reference to its freedom from dust and other suspended matter.
4. Air sanitation with reference to its freedom from bacteria.
5. Relative humidity.
6. Distribution.
7. Air motion.
8. Freedom from odors.
9. Freedom from other injurious substances.
10. Freedom from monotony, in regard to noise and too much regularity of indoor conditions.

Air supply is put at the head of the list, because without air supply there can be no artificial ventilation. Air temperature is second, because it has been proved by practically all of the accredited experimenters that overheating is more detrimental to the quality of ventilation than any other one thing.

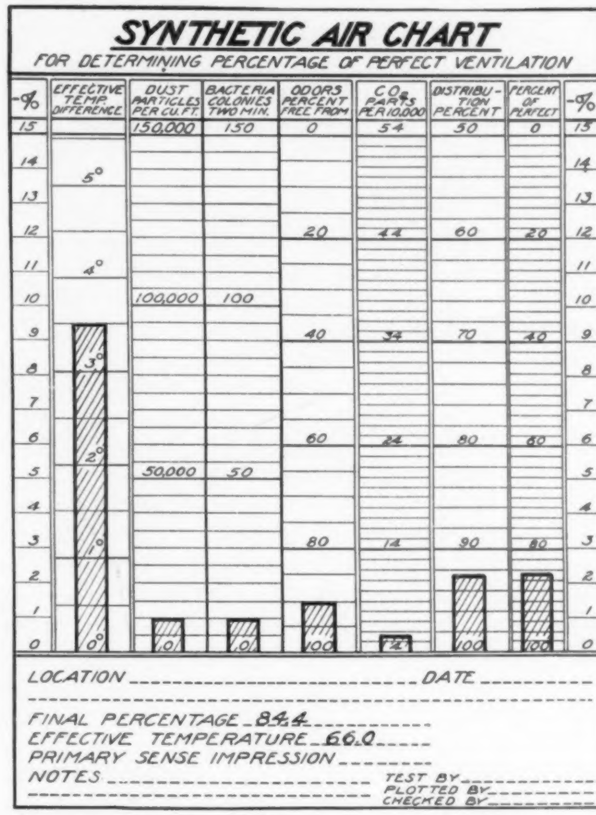
Air cleanliness is third, because it has to do with human health from the standpoint of freedom from dust and other suspended substances which irritate and clog the air passages, and from the standpoint of freedom from bacteria and other media of infection carried along with these substances. Air sanitation is fourth, as it also affects human health and is correlated with the third item. Relative humidity is fifth, not because it is of so much less importance than air supply and temperature, but because it also bears such an intimate relationship with these two items that it receives a part of its due consideration in their determination. Distribution is sixth, for a similar reason, for while it occupies a much more important place than this position might indicate, it is intimately connected with the effective air supply

because it is a factor in effective temperature. Air motion is seventh, in the same way. Freedom from odors is eighth, for the reason that odors are seldom dangerous or permanently detrimental to health, though quite disagreeable and even nauseating. Freedom from other injurious substances is ninth, because these substances are seldom found in ordinary ventilating practice and must be practically eliminated in any case. Freedom from monotony is tenth, because it has to do with the last refinements and the psychology of ventilation only.

In order to properly measure and compare the effects of these various factors the synthetic air chart as shown in Fig. 2 has been devised and adopted as the standard measure of the quality of ventilation. This chart takes air supply into account under the heading of carbon dioxide content, $CO_2$. The scale for this factor is based on the assumption that 300 parts of $CO_2$ in 10,000 parts of air, together with the other vitiation which would accompany this quantity of $CO_2$ when exhaled with the human breath, might produce results that would be permanently injurious to health. For each part of $CO_2$ in 10,000 (above that ordinarily contained in the outside atmosphere and assumed at four parts in 10,000) a deduction of 1/3 per cent is made for this particular column or department, and 0.3 per cent as the deduction in the final per cent of perfection column. The various other air factors are given their proper weight in determining the percentage rating of the ventilation conditions in the test. Air temperature, air motion and relative humidity are represented under the column of effective temperature difference. The percentages of perfection for good ventilation as thus determined range from 95 in new school classrooms to 80 in existing churches.

In the normally crowded city places of assemblage the heat given off by the occupants together with that given off by the lighting and power equipment is usually more than the normal heat loss through the structure to the outside air, even in winter under cold climatic conditions. This means that in order to preserve an equilibrium of effective temperature the entering air must be cooler than the leaving air, so that the problem is usually one of cooling and ventilating rather than heating and ventilating. In the practical work of engineers who design ventilating systems, and of architects and owners who pass upon these systems, the one item involving standards which is the basis of all calculations and layouts is the quantity of air to be handled by the system. The functions of the air are to supply the necessary oxygen for respiration, to keep the dilution of $CO_2$ and other objectionable substances down to the proper point, and to maintain the proper effective air temperature.

On the basis that the air brought in from the outside is for oxygen supply and dilution only, these cubic feet per minute per person would be required for the ventilation percentages shown, if all other factors are 100 per cent perfect.




*From A. S. H. & V. E. Guide*

Fig. 2. Chart for Recording Results of Ventilation Tests

| *Percentage of perfection* | *Cu. ft. of air per minute required per person at rest* | *Cu. ft. of air per minute required per person at hard work* |
|---|---|---|
| 98 | 15.0 | 30. |
| 96 | 7.5 | 15.0 |
| 94 | 5.0 | 10.0 |
| 92 | 3.75 | 7.5 |
| 90 | 3.0 | 6.0 |

In theaters, assembly rooms, auditoriums and other places of public amusement and assemblage there are usually several other factors to consider, such as the removal of excess heat, excess moisture, dust raised by the movements of the occupants, and odors. We may not hope to get better than from 40 to 60 per cent ventilation in warm summer weather without some method of air cooling. Air motion will assist, but unless increased beyond the usual 10 to 20 feet per minute ordinarily obtained from the movement of the air through the room, it will not improve the percentage of ventilation by more than from 2 to 3 per cent. By the use of refrigerating and dehumidifying apparatus this effective temperature department can be maintained at any desired percentage of perfection. The use of a good air washer should reduce the temperature about 70 per cent of the difference between the wet and dry bulb temperatures. About 10 cubic feet of air taken in from the outside, per person per minute, is

sufficient for winter conditions but inadequate for summer climates, where heat and humidity are the determining factors, unless refrigeration is used. It should also be noted that increasing the air supply from 10 to 50 cubic feet per person per minute gives little improvement unless some form of artificial cooling is used.

It would seem that about 75 per cent ventilation can be obtained under reasonably severe summer conditions with an air supply of 30 cubic feet per person, using an air washer, and that beyond this point there is little to be gained by increasing the supply. It should be noted that this is based on upward ventilation and that the cooling effect of from 5 to 10 degrees with air washers of perhaps twice this amount with refrigeration will produce uncomfortable drafts on the occupants at times. For this reason and for the further reasons that it is more sanitary and more easily controlled, the downward system of ventilation is perhaps more efficacious in large and constantly used places of assemblage. On account of transporting all of the heat from lights downward and of forcing the body-heated air back over the occupants, it is usually necessary to do much more cooling of the air than can be done with the air washer without refrigeration. On the other hand, the air is brought in high enough to permit of its being diffused and brought to the proper condition before coming into contact with the occupants. It can be seen, therefore, that the air supply per person per minute for assemblies could be 10 cubic feet in winter, 30 cubic feet in summer with the air washers, and anywhere between these two figures for the entire year with refrigeration. Also that nothing better than about 75 per cent ventilation can be secured in hot, sultry, summer weather without artificial cooling, but that with cooling, especially if the air supply is taken from overhead and exhausted from below, almost any percentage of perfection can be maintained.

*Recirculation.* The foregoing does not take into consideration the matter of recirculation, but it can readily be seen that there is little to be gained by recirculation unless an appreciable amount of $CO_2$ and attendant impurities which are put into the air can be taken out during recirculation. The handling of the larger quantity of air may be of value to produce air motion or for use as a better cooling medium with less temperature difference between incoming and outgoing air. Recirculation may also be used as a purely economic feature during the warming up of the building or during periods when the space is only partly occupied and the mechanical arrangements are inadequate for properly varying the quantity of air handled to suit. A good arrangement is to provide apparatus for handling 30 cubic feet of air per person per minute with provisions for recirculating any amount up to as much as two-thirds of this. The percentage of air recirculated may be varied to suit the seasonal change so as to conserve heat in winter and refrigeration in summer.

Where effective temperature is controlled, according to the usual method, from the dry bulb temperature in the room, there may be a wide variation in this effective temperature due to the varying amounts of moisture in the air, unless humidifying apparatus with accurate humidity control is employed. Between the condition of absolute dry air at 70° and absolutely saturated air at 70°, there is a difference of 10 degrees in effective temperature which means an average difference of 25 per cent in the quality of ventilation. This may be taken to mean about 10 per cent on each side of the neutral point for ordinary ventilating conditions, so that the air washer and humidity should improve the ordinary ventilating plant another 10 per cent on this count. Good filters will of course serve the same purpose for cleaning the air of suspended matter, and may improve the ventilation about 10 per cent.

*Relative Humidity.* It should be noted, in connection with our present means of measuring and comparing qualities of ventilation, that we do not take into account any of the functions of the relative humidity of the air except that bearing upon effective temperature. This means that air of any temperature and relative humidity, within proper physical range, i.e., below 64° wet bulb, may be made to meet the comfort line by either heating or cooling without addition or deduction of moisture. Absolutely dry air may be heated or cooled to 78° and be 100 per cent as far as effective temperature is concerned, and still be far from perfect as far as effects on the membranes of nose, throat and lungs are concerned. Such dry air is also very conducive to the increase of dust in the atmosphere of a room from the standpoints of dryness and electro-static agitation. The air washer and humidifier correct these difficulties, and there should be some definition of limits for the relative humidity in our measure of ventilation.

*Eliminating Dust.* It is not unusual to find from one to two million particles of dust per cubic foot in the outside air surrounding city buildings, and unless this is eliminated it will give dust counts in rooms equivalent to a deduction of from 5 to 20 per cent in the perfection of ventilation. A good air washer should eliminate from 80 to 90 per cent of the dust entering the intake and perhaps reduce the dust penalty in the rooms to less than one-half of these figures. It will be seen, therefore, that air washing and humidification may improve the quality of ventilation about 10 per cent in the effective temperature department, plus another 10 per cent in the dust department, plus other improvements in the quality of ventilation by maintaining proper humidity and removing injurious substances and odors.

# ARCHITECTURAL LAW

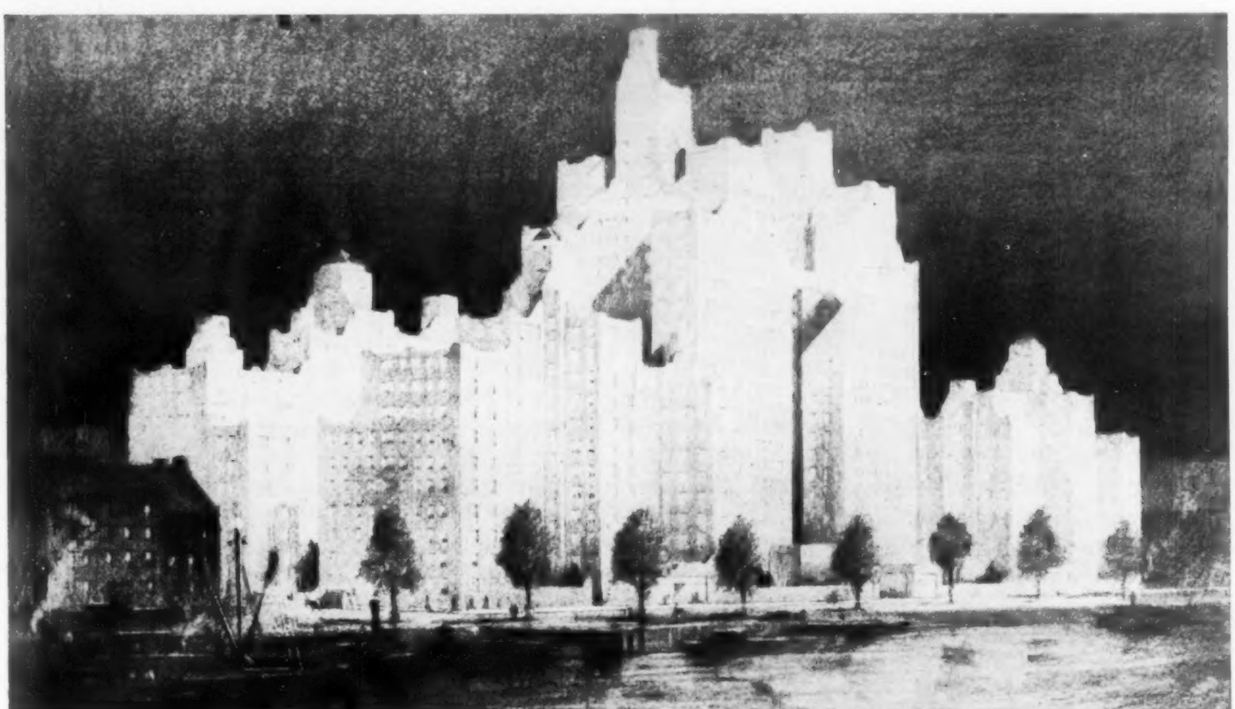
## THE DWELLINGS LAW

BY
JOHN TAYLOR BOYD, JR.

RARELY has an item of legislation so interested New York architects as the proposed "Dwellings Law," which was submitted to the legislature last winter by the "Temporary Commission to Examine and Revise the Tenement House Law." The Real Estate Board of New York requested the appointment of this Commission for the purpose of making changes in the existing tenement house bill, which applies to the design, construction and maintenance of apartment houses in New York and in Buffalo. The request was worthy, for there can be no question that the existing law is obsolete in many provisions, and that it imposes unreasonable and costly penalties on design and construction.

So a new standard was demanded. Should it be a higher or a lower standard? That is the question. "We want a higher standard in some respects," said the Real Estate Board in effect, in its detailed recommendations to the Commission. "But," said the Real Estate Board, and here there was raised a large issue, "we want the privileges of building a greater bulk of structure on a given site, up to the limits permitted by the local zoning regulations which allow greater bulk for business structures, hotels, apartment hotels and institutional buildings, than does the tenement house act in the case of apartments." In other words, the real estate organization demanded lower standards of light and air, although generally it favored adequate protection of sanitation and fire safety. But the Commission thought otherwise. In its proposed law the Commission stood squarely for somewhat higher standards of light and air than those in the existing tenement house bill. It went further. In order to protect the light and air of the individual property owner from the blanketing effect of tall non-apartment structures, the Commission greatly broadened the scope of the law. It included within its jurisdiction hotels, lodging houses, boarding houses, boarding schools, furnished room houses, lodgings, club houses and college and school dormitories, as being multiple dwellings, designating them as "Class B." "Class A" designation means multiple dwellings of the apartment class and includes apartment hotels. By this means, practically all structures that are likely to be erected in a residential district are brought under the same regulations governing height and bulk, thus enforcing a more orderly arrangement of buildings and blocks and preventing blanketing light and air.

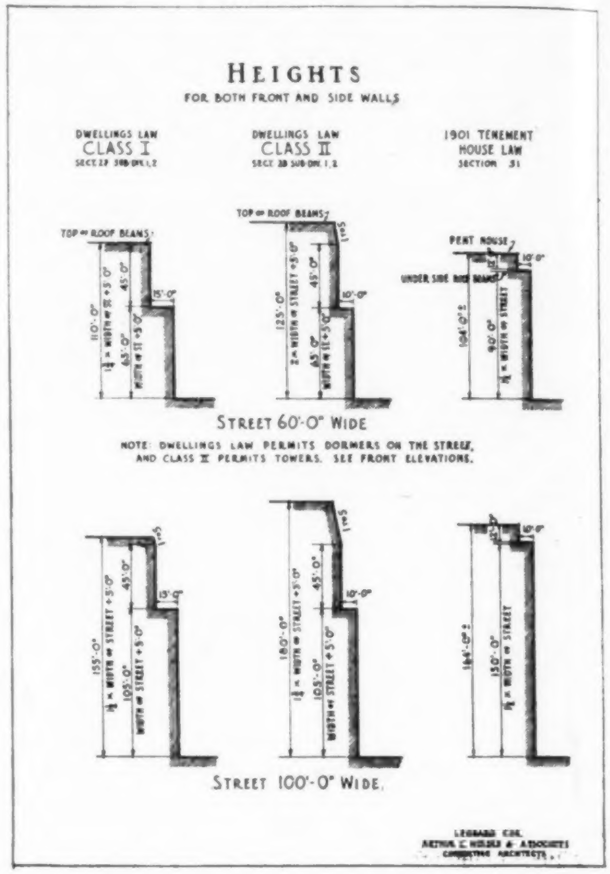
The Commission went still further. It enforced certain requirements of plan arrangement, sanitation and fire safety for dwellings likely to be converted in the future for multiple occupancy, in order that undesirable building may not result; and it also en-



Possible Low Rental Development of City Block Under Proposed Dwellings Law
Arthur C. Holden & Associates, Architects

forced additional requirements of fire safety and sanitation on tenement houses erected prior to 1901, which have proved veritable fire traps and dangerous sources of infectious diseases. It also enforced higher standards on houses already "converted" illegally which had escaped the administration of the tenement house law, and of which the Commission says that some 30,000 cases exist. These requirements are chiefly matters of alteration and repairs. They are very important, however, as will be realized from a detailed reading of the law.

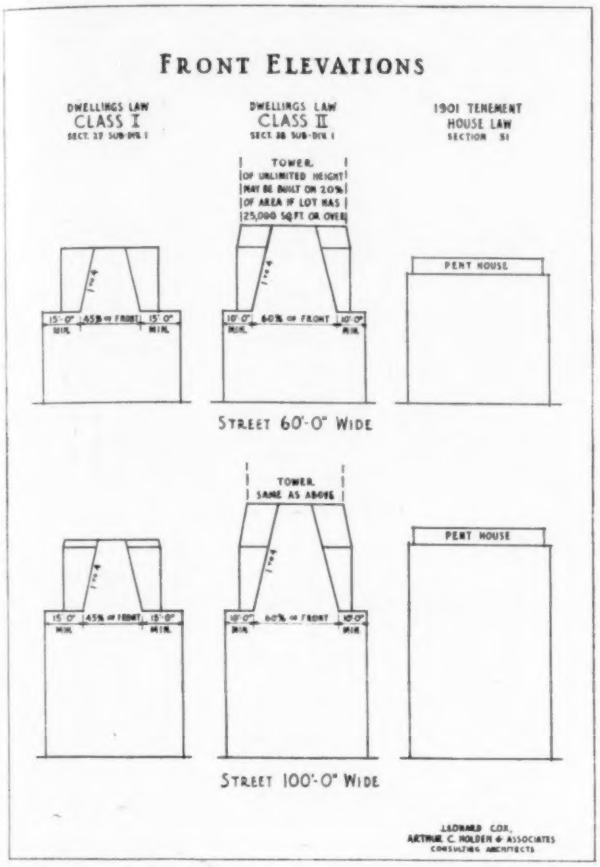
It is the new standards set for new multiple dwellings that are of the greatest interest for architects. Here the new law goes well ahead in the prescription of an improved type of apartment house. The net rentable area permitted under the Dwellings Law appears to be about the same, or even a little greater than under present practice, as indicated by the table of comparative floor areas under the existing law and under the proposed measure, and by several typical floor plans of apartment houses. This is part of the work of the consulting architect of the Commission, Leonard Cox, of Arthur C. Holden and Associates. But, although the volume of building is roughly identical, a new shape of building is required. Larger courts and rear yards are necessary;—on the street fronts the cornices must be dropped about 30 per cent lower than at present, and on all four sides, if the building is to rise higher, there must be stepbacks until the maximum height limit is reached. This maximum height is raised above the limit of the existing tenement house law, thus giving back to the property owner the bulk taken away from him in the lower stories of his building. This is the great advance in standards made by the law. It brings us nearer the ultimate goal of the free-standing city building, which is essential for the skyscraper. On page 27 of its report, the Commission says that "the ideal condition (for light and air) involves a spacing between structures equal to twice their average height." The lower of the standards prescribed in the law shows, as the result of scientific candlepower measurement, 50 per cent more daylight and 20 per cent more sunlight than under the existing law's minimum standard. Judged by this criterion, the advance can be carried much further before a wholly satisfactory condition is reached. But, judged purely architecturally, the advance is greater than that. In the lower stories the skyscraper is partly disengaged from its neighbors along the lot lines, through larger court requirements,—something the Commission was very particular about,—but even more important, the buildings are completely disengaged beginning at a height approximately above the sixth story. "Dormers" are permitted on the street front, much as in the New York zoning regulation. In addition, a tower, covering no more than 20 per cent of the area of the site, where the plottage is 2,500 square feet or more, may be built up to an indefinite height under certain circumstances. The operation will be seen in the diagram, and one is referred to THE FORUM for February, to the article on "Architectural Law."

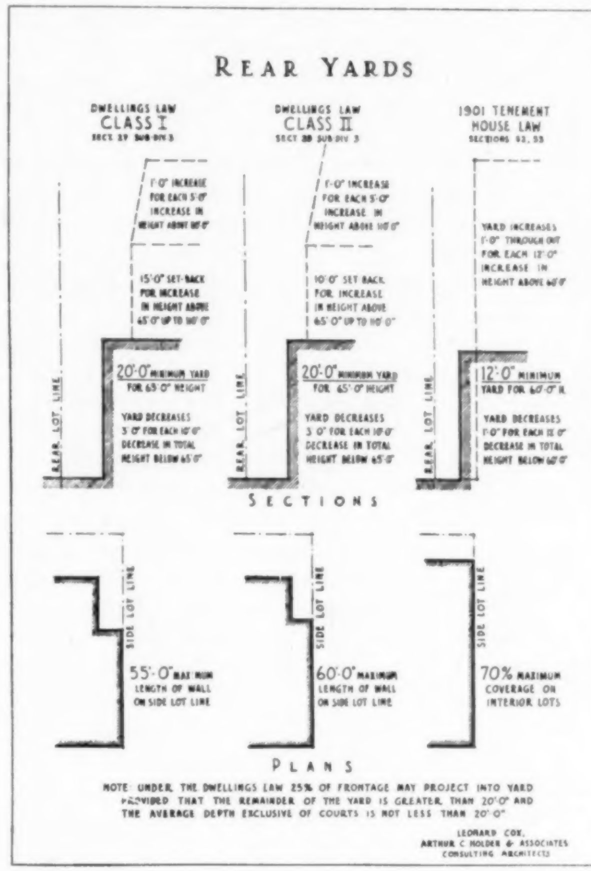



Heights and Setbacks for Front and Side walls

The purpose of the lower cornice heights, larger courts and yards and the pyramidal stepbacks is to admit more daylight into the lower stories of the city block. In the individual structure, a much larger proportion of rooms will be arranged two deep, and the stepbacks will facilitate the planning of single apartments with two or three exposures and terrace spaces. Quarters will be more like homes, with some of the amenities which make life decent. Architects will certainly approve of this standard, and will view with favor the appearance of the new type of city building which it introduces. They will see that it brings architecture back into city buildings and makes for order and an orderly city, as Harvey Wiley Corbett has well said. Under present conditions, skyscrapers,—yes, and lower buildings,—are jammed together, usually on undersized or ill-shaped plots, the buildings themselves distorted, box-like, ugly. The result is bound to be low-standard, no matter what the architect's ability. What has become of architecture as an art of three dimensions? There is no real planning but merely a skillful piecing together of a few standard parts and details. Homes have no character, and all look as much alike as rooms in a hotel. The people who must live in these abortions are getting well fed up with them.

As regards elevations of the typical New York apartment, what more favorable can be said? Eleva-




Possible Front Elevations and Rear Yards Under Proposed Dwellings Law and Under 1901 Tenement House Law

tion as an integral part of a mass,—which is the essence of architecture,—is nowhere to be seen, unless in a few exceptionally well situated buildings. The architect is a mere surface decorator,—as the engineer has at times unkindly called him,—a beauty specialist, who "lifts" the faces of buildings. Where are there any signs of beauty on Park Avenue, with its miles of solid walls of *casernes?* Billions of dollars' worth of buildings in New York, built from acres of blue prints skillfully contrived, but scarce a cent's worth of architecture! The Dwellings Law should abolish this unhappy practice, from which, in the long run, nobody gains.

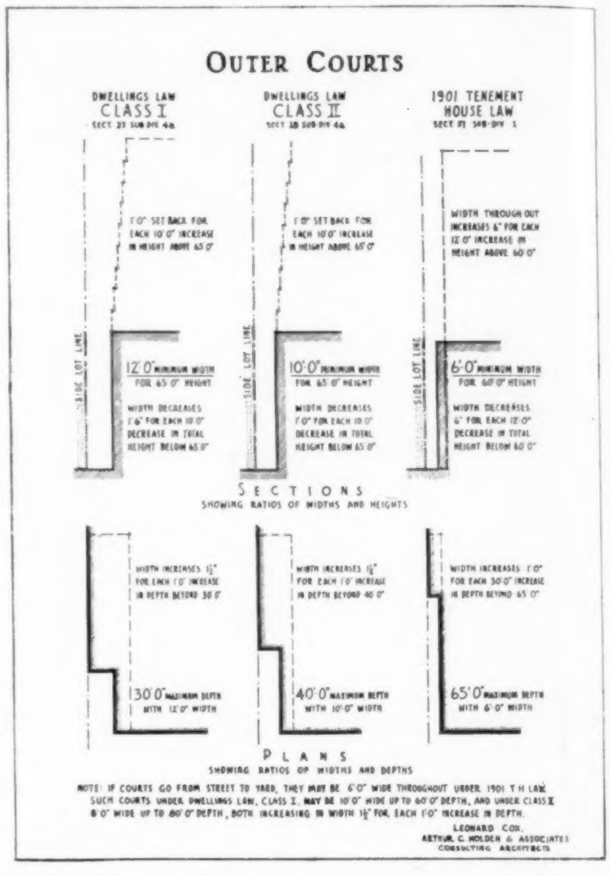
But the most novel feature of the new law is the introduction of the principle of adjusting standards of light and air according to land values. Greater bulk, i. e., lower standards of light and air, are allowed on practically all of Manhattan Island, and on a very small portion of the area of Brooklyn which amounts nevertheless to about half the area of Manhattan. The exact working of this double standard should be clearly understood. The Dwellings Law requires that all new multiple residence structures built on sites, the assessed value of which, exclusive of the buildings thereon, is not more than $2 per square foot, be deemed "Class I" buildings, and that those where the assessed value of the site is higher be "Class II," as explained in the Commission's report. Class I structures are restricted to a lower height and smaller area than are Class II, and they do not all enjoy the tower privilege allowed in Class I for plots of 2,800 square feet or larger. This distinction does not mean that $2 per square foot is a theoretical dividing line for a change in standards of bulk. It is more practical than that. It means that the Commission mapped out the "unspoiled" areas of Greater New York and then took this figure as a formula which best fitted actual conditions. The outstanding fact is that throughout the Class I areas there are practically no buildings which are built up to anything like the bulk permitted for Class I. In Brooklyn, for example, practically all existing buildings in Class I area are less than five stories high. There is thus ample opportunity under the law for larger buildings and consequent increased land values in Class I area. The differences between Class I and Class II requirements are seen in these illustrations.

Another excellent feature of the Commission's work was the enforcing of better conditions along side lot lines. This is a further step toward the ideal of separation of adjoining buildings, which has become essential in the modern city because of the introduction of the skyscraper and the increase of traffic in the streets. Indeed, in these many provisions governing bulk, mass and planning, may one not conclude that here is an almost new type of law governing buildings? It is an architectural law, instead of a construction or sanitary law, a *plan* law,

as distinct from the usual *specification* law which the average building code is;—is this not significant? To be sure, building codes and zoning laws have provisions governing plan, and this Dwellings Law, as well as its progenitor, the existing tenement house law of 1901, contains provisions requiring standards of sanitation and of fire safety. But the distinction seems sound. Its introduction is significant today, when every evidence points to a growing public demand for a more scientific coördination of buildings, one with another, and with the city plan.

One other important provision of the law deserves the sympathy of architects. That is in the further restrictions which are placed on the narrow lot of about 25 feet frontage, making more difficult its use for a skyscraper. The existing tenement house law legislated indirectly against the narrow lot to such an extent that in Manhattan and the Bronx it generally forced the abandonment of the 25-foot lot for five- and six-story tenements, at first to the despair of builders, but afterwards to their satisfaction, because they now use wide frontages, 100 feet or more, for either skyscrapers or "walk-ups." But in Brooklyn, multi-family dwellings are still built on narrow plots. On the whole, it is just as unreasonable to ask that a tall building be allowed on a narrow lot as that an automobile be run on the sidewalk!

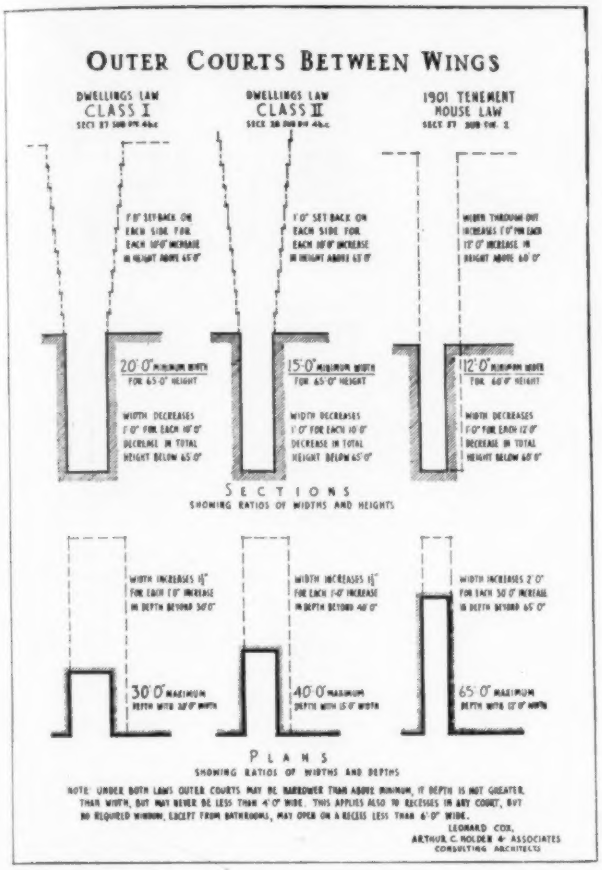
Again, let it be remembered that all these questions are fundamentally those of light and air. "Shall I develop my property at my own expense, or shall I contrive it so that I can force my neighbors to pay for it?" In England there is the law of "ancient lights" which protects a property owner in his rights to light and air, and it is said that portions of Westminster Abbey had to be set back in order to maintain the neighbors' rights. Would that a similar law could have been invoked in the United States when the skyscraper appeared! Then we should have seen this wonderful modern invention of the architect used as a blessing and not as an apple of discord! In New York, as already suggested, no one can be found to admit that he disbelieves in light and air. In fact, the tendency of both real estate promoters and of tenants is increasingly in the other direction. The difference is that the tenants are more willing to pay for it themselves. The real estate promoters, on the other hand, have engaged in a scramble for special sites where, paradoxically, the other fellow pays the bill. There are plots which are situated on street corners, or opposite parks or beside low buildings of a fairly permanent character, such as single-family houses, public structures, schools, churches, etc. But, as more and more skyscrapers appear, the number of these strategic sites grows smaller. There is increasing danger for the man who blankets his neighbor's property that his own building in turn may be blanketed or closed in. The opponents of the Dwellings Law, in alleging cases (in which they were rarely sustained) of hardships created by the new law, appeared to forget that the existing law creates infinitely more cases of damage to property.

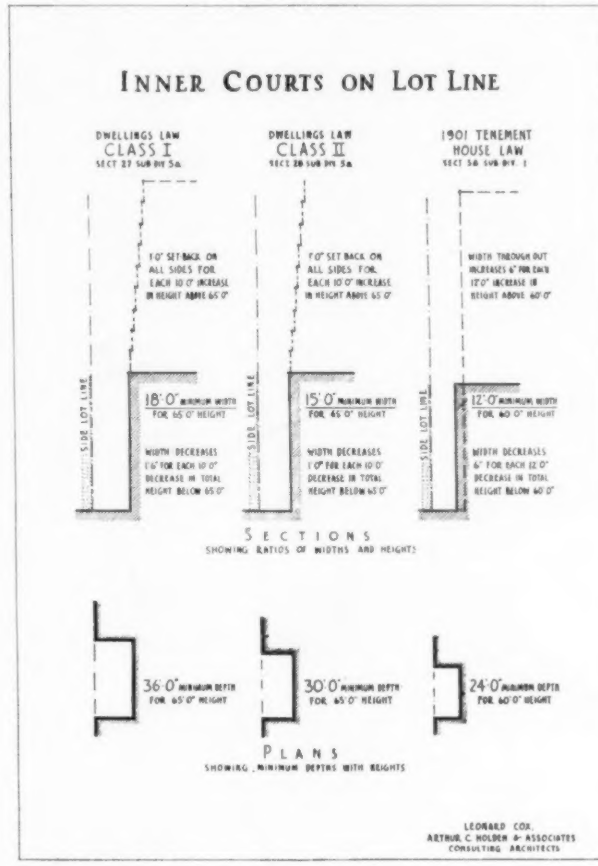



Possible Dimensions of Outer Courts Under Proposed Law and Under Existing Law

Furthermore, the existing law was originally designed to apply to "walk-up" tenements, at a time before the skyscraper problem became acute, and consequently the coverage and court sizes prescribing for low buildings none too sufficient light and air, are impossible for skyscrapers of from two to three times that height.

There are many other provisions in the law relating to new buildings which will repay study. Complex as it is, it is admirable in being written in every line under the supervision of an architect, in coöperation with the counsel of the Commission, Harold Riegelman. The consulting architect had the criticism of other architects and many experts. As a result, the bill is free from those grotesque provisions that are now and then found in building codes, and which indicate the hands of engineers who lack knowledge of planning. Also, the bill is purposely drawn to serve as a handy manual for architects, builders and owners, instead of being merely the usual catalog of "can do" and "cannot do," which wastes so much time on a drafting table. The provisions regarding sanitation and fire safety are worth study in themselves, in their application to both new and existing buildings. Interesting facts in this connection are that 60 per cent of fires in non-fireproof buildings originate below the second floors, and that the worst hazard is a non-fireproof stair. Particularly necessary is the requirement that



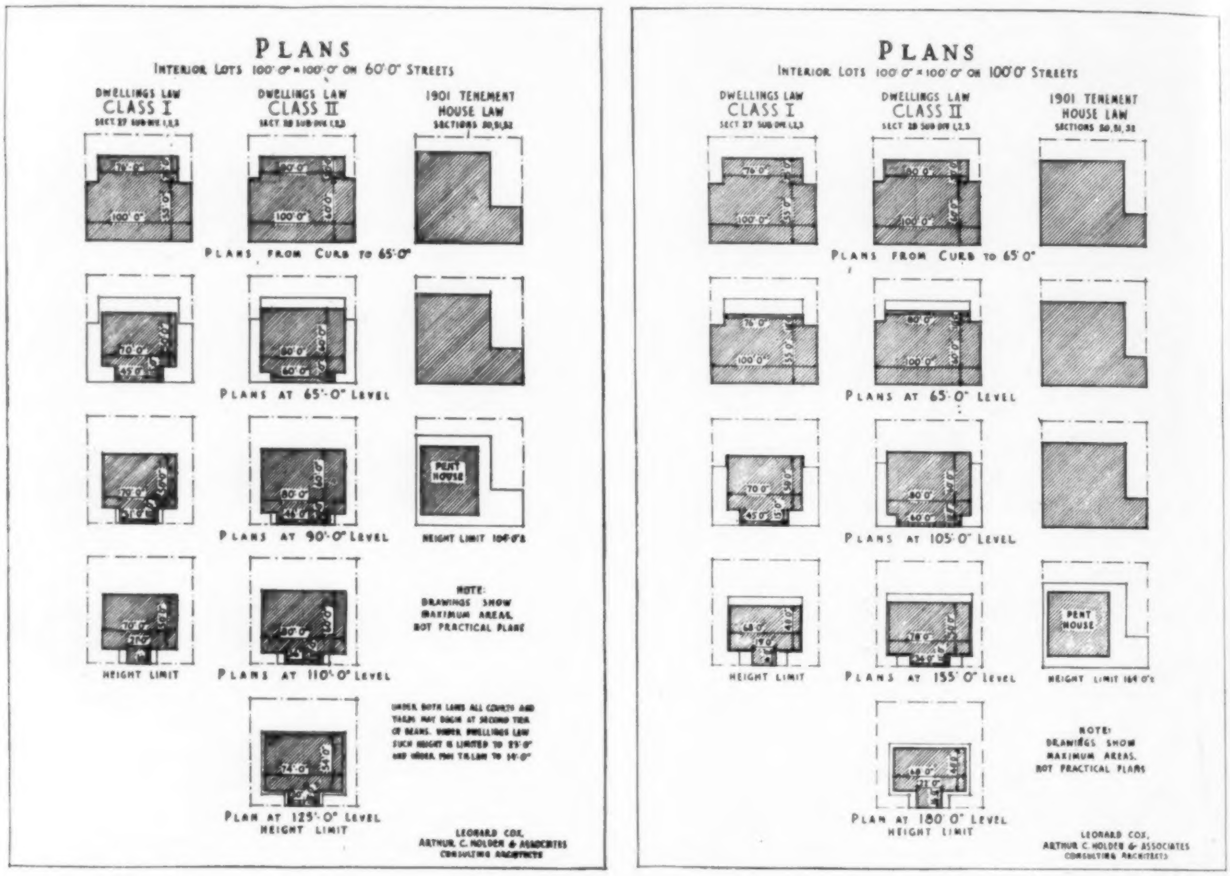




Comparison of Requirements in Regard to Sizes of Courts Demanded by Proposed and Existing Laws

frame buildings be spaced farther apart, about 12 feet as compared with the 4 to 6 feet permitted by the New York code. The result of this local practice has been to create huge areas of little frame dwellings, often of flimsy construction, equal in total area, it is said, to that of Chicago at the time of its great fire. This frame construction is located in the borough of Queens. In many cases it is without adequate fire protection, and is probably one of the worst fire hazards in the world, comparable only to Yokohama and Tokio before the recent fire and earthquake. The New York Chapter of the A. I. A. had previously publicly called the attention of the city authorities to this menace. The Mutual Association of Lumber Manufacturers approved the restriction on this hazard as preventing an illegitimate use of lumber. The underwriters also supported the law.

These portions of the law are important for architects, because in similar situations architects may find it difficult to gain the political support of other interests for improved standards for new buildings, unless they themselves are willing to take a stand in regard to structures already existing. One can readily see that such a law as the Dwellings Law, enforcing higher standards for nearly all classes of residence buildings, provoked certain real estate circles. These interests viewed the Commission as its own progeny and were shocked to find disobedience to their wishes. A small hornet's nest was stirred up, and in the excitement it was even rumored that some architects thought they had been "stung." The result of the controversy at the time of writing is that the Commission will be continued for another year for the purpose of proving its case to the public. In nearly a hundred years of tenement house legislation in New York, no measure looking toward improvement has ever failed to be enacted. Nevertheless, the bearing of real estate opinion is important in evaluating an architectural law. In New York, the opposition developed from a small minority which had been guilty of violating or evading existing laws. Others had an interest in low standards, such as the frame construction fire hazard or ramshackle "old law" tenements. The latter were built prior to 1901, have paid for themselves, and should be scrapped.

The more powerful opposition to establishing improved standards is of a different type, coming from people holding a number of views. There are those who will not take time to examine the law carefully. Others want no change under any conditions, and object to the inconvenience of change. Judging from the approval of the new law given by a few prominent real estate men and builders, the Commission may expect to overcome this opposition in the course of a year. It should be able to prove to the more responsible real estate men that the law will give better protection to property than does the existing regulation. The Commission should be able to demon-




Maximum Plan Dimensions Allowed at Various Story Levels Under Proposed Dwellings Law and 1901 Tenement House Law

strate that not only is the rentable area of buildings as large under the Dwellings Law, but that this area has, in one way or another, greater rentability, since it is generally more desirable space, even in the lower stories. In addition, the Commission has simplified the intricate provisions of the existing tenement house bill relating to stairways, halls, elevator vestibules and other means of egress. These latter economies are appreciable, and they offset any slight increased cost of the stepbacks. Most of these minor improvements which relate to new buildings are heartily approved by real estate men and builders. These considerations, however, do not entirely explain the basis of the real estate attitude. The speculative foundation under so much real estate activity is, of course, the real reason for opposition to architectural laws enforcing higher standards. It is this speculative phase which works such injury to the building industry. Excessive speculation is obsolete today in most of the American industrial, business and financial world. The trend is all the other way,—toward a solid investment basis,—and it is doubtful how long real estate can lag behind.

At any rate, the havoc wrought in New York by low standards of development is terrific, if we are to believe the statement made to *The New York Times* by Thomas Adams, the well known city planner and city borough director of the Regional Plan of New York and Environs. "It is giving people what they want that makes buildings profitable," said Mr. Adams. "The demand today, even among the comparatively poor, is for buildings that have light, air and good sanitary conditions." Then Mr. Adams referred to the startling fact that low standards were doubtless the chief reason for the exodus of New York's population to Westchester County on the north, to Nassau County on the east, and to New Jersey across the river. In Nassau and Westchester Counties "the increase in population was, during the five-year period previous to 1925, 34.6 per cent as against 4.5 per cent" in New York, or about 8 to 1. There is plenty of room left in New York where, as the Regional Plan had previously pointed out, about 90 per cent of the population lives in about 10 per cent of the area. This is the answer to those who defend congestion in the greatest and most congested city in the world!

The zoning resolution of 1916 has done practically nothing to relieve congestion in New York. One might even argue that zoning has increased it. The Dwellings Law is perhaps the first real step toward that end. Since, at the same time it establishes better living conditions and brings back architecture into city dwellings, the law is an aid to architecture.

# BUSINESS AND FINANCE

## THE ARCHITECT'S POSITION IN RELATION TO MORTGAGE FINANCING

### PART I. IN THE FIELD OF DWELLING CONSTRUCTION

BY

C. STANLEY TAYLOR

Editor's Note. This is the first of several articles which will discuss mortgage financing for various types of buildings, and particularly the architect's functions and responsibilities in connection with this important phase of building. These articles will also set forth the general requirements on the part of mortgagees, which have been developed as a result of experience in this type of financing.

THE use of mortgage financing for residential projects of all types has become so general within the past few years that practically no dwelling is built without the provision of a large proportion of the necessary funds through such channels. In fact, it may be said that probably 75 per cent of the total amount expended for new dwelling construction is originally derived from mortgage sources of various types. This includes, of course, first and second mortgages, or, as the terms are often used today, "senior" and "junior" financing.

For a great many years mortgage financing in the residential field was somewhat haphazard in its nature, mortgages being obtained usually from individuals or from savings banks, estates or institutions. The last two decades, however, have seen a sound and scientific development of this function of mortgage financing for residences. There have been established, often with very rapid growth, banking institutions having as their sole function the provision of mortgage money for the residential field. These include not only building and loan associations, but divisions or offshoots of title guarantee or trust companies and also real estate bond houses whose function it is to secure money from the public for use in this manner. The older types of mortgage sources, such as savings banks and insurance companies, have developed their departments to such a degree that in some cases a great many million dollars are loaned annually by individual organizations. In addition to these large individual loaning sources, we find that the organizations which specialize in building and permanent loans for residences have grown in some cases to such sizes that thousands of homes are financed annually through individual companies. As might be expected, this tremendous extension of mortgage financing has brought with it exhaustive economic study on the part of those who are interested in the subject, and particularly by those who are investing their money in this manner.

Before going into this phase of the subject, it might be well to deviate for a moment in order to describe briefly the more or less standardized existing sources and methods through which money is obtained for the purpose of financing residential construction. The various forms in which senior or first mortgage financing is obtained include straight building and permanent loans, which are placed on the property for a definite period of years, usually three or five, and the amortizing type of first mortgage which is reduced periodically until it is paid off or replaced by a straight loan. The most usual form of amortizing first mortgages is typified by the financing which is provided through building and loan associations. As a general rule, the owner of the house pays 1 per cent of the face value of the loan each month. By doing this, the interest and principal of the mortgage are completely paid in approximately eleven years and seven months. Other types of amortizing mortgages have no standard rate of payment, but are simply developed through individual agreements between owners and mortgage sources, and can be arranged to meet the owners' personal financial situations.

The junior financing or second mortgage phase of a home-building operation is usually developed in one of three ways: (1) by a direct second mortgage loan, established for a given period of years (usually expiring when the first mortgage does); (2) by a second mortgage, provided through an arrangement with the building contractor; or (3) as is often done, when part or the whole of the purchase price of the land is subordinated to the first mortgage and takes the form of a second mortgage. Most second mortgages are today placed on an amortizing basis to be reduced by easy payments over a period of a few years. This entire junior financing market is entirely disorganized, or it might be more correct to say that it has never been organized. For some reason it has received practically none of the careful study which has been given to senior financing. As a result, the second mortgage field presents many dangerous factors. It abounds with evil practices in which shrewdness and unscrupulous manipulation in many instances threaten the home owner with direct loss of his money, if not of the property itself. Because there are no organized methods of second mortgage financing, and few if any recognized channels for the clean handling of this important phase, it is difficult to obtain junior financing except by the payment of high premiums, and there is also a constant traffic in the discounting of second mortgages, which as a rule the contractor or the speculative builder figures in as part of the cost in the building of homes.

The customary sources through which first mortgage money for home-building is obtained include primarily savings banks, insurance companies, title guarantee companies, trust companies, real estate loaning institutions, estates, and individuals. The amortizing type of first mortgage is primarily obtained from building and loan associations which function also as savings banks for prospective home-

builders who wish to accumulate part of the necessary investment before actually beginning building operations. Some of the real estate loaning institutions offer various types of amortizing first mortgages, and because of the amortization feature, it is usually possible to obtain a larger loan in proportion to the value of the property. With this general background in mind, it soon becomes apparent that the more scientifically mortgage financing is administered in the residential field, the more important becomes the architect's relationship and his responsibility. Many of the established loaning institutions or sources have come to realize that they must to a considerable degree control both the *quality* and the *design* of the buildings which are to become collateral for mortgage loans. The customary first mortgage loan is approximately 60 per cent of the appraised value of land and building, while through second mortgage channels from 15 per cent to 20 per cent more of the cost may be borrowed. Thus if a project carries both a first and a second mortgage, the owner as a rule will have only 25 per cent or less of the cost as his immediate equity.

Obviously, it is really the loaning institution which pays the bills for materials and labor, for architects' fees and contractors' profits. It is but natural, therefore, that many of the loaning institutions have developed departments or employed supervising architects to check carefully the plans and specifications submitted in connection with mortgage applications. Here is where the architect of the individual project enters very importantly into the financing picture. If his plans are efficient in character, representing sound, economical construction methods, and if his specifications present a selection of materials which seem to insure permanency and low maintenance cost, it is quite apparent that when the mortgage company makes an appraisal, the home owner will receive much more favorable financial consideration and will be able to carry out his project with a smaller cash investment. An examination of the records of mortgage companies will show a great many instances where mortgage loans have been refused because plans were impractical or specifications were not drawn in a manner which would insure good construction. After all, the ultimate real estate valuation of a completed project and the likelihood of its maintaining a consistent, good market value must be highly important from the point of view of those who provide mortgage money. Not only must the property hold its position in competition with other dwellings which may be offered for sale in the immediate neighborhood, but it must be of a character which is readily salable, so that it will not enter the so-called "white elephant" class of dwellings on which past experience has shown extensive losses, not only for owners but for mortgagees.

In designing dwellings for individual owners or for speculative builders, the architect in modern practice is usually called upon to have a clear understanding of mortgage financing methods and to assist the owner in obtaining favorable financing. In fact, in many instances today the architect performs the financing function and finds it to be a valuable part of his service. If he designs many houses, he soon becomes well known, at least to local loaning institutions. It is not an unusual experience to hear bankers make the statement that on houses designed by certain architects, they will readily give higher appraisals and make loans perhaps 10 per cent greater. This is because they know through experience that the particular architects in question plan efficiently and build well. In other words, they know how to create collateral better than the average. Most architects probably know by experience that the average home-building client is not familiar with mortgage sources or mortgage methods. As a result, the business aspect of many of these projects is not good as originally established by the home-builder. Often it turns out that the home-builder has not sufficient money to provide the necessary equity, and if the architect understands local mortgage financing, he may be able to rearrange the situation so that the project may proceed instead of being abandoned or held in abeyance until the owner finds himself better situated financially.

There are at least three ways in which the architect benefits directly through the development of knowledge of this kind. He gains an enviable prestige, not only with financing institutions but in real estate and local home-building circles, so that such knowledge often brings in commissions which he would not otherwise obtain. He will find that local real estate operators and real estate brokers appreciate business-like administration on the part of the architect, and that they are much oftener ready to work with an architect who combines knowledge of both design and the business phase of a residential project than with one who must be constantly checked from this angle. It is also often the case that mortgage institutions will recommend architects because they have developed appreciation of the architects' business-like service as well as of their designing ability.

It should, of course, be apparent that no one expects the architect to have an intimate, detailed knowledge of mortgage rates, discounts, and the other technicalities of this type of financing. If he possesses such knowledge, it is of great value, but the type of knowledge and experience which is really desirable in this connection involves primarily technicalities of design and construction. In other words, the architect's function is to design a project in a manner which will be consistent with the requirements of those who are expected to loan money for the operation. For this reason, it may be of interest to review briefly some of these requirements as they have been expressed from time to time by those in charge of the appraisal or technical departments of loaning institutions.

When a mortgage application covering a home-

building project is brought to one of the modern types of mortgagees, the first consideration is usually given to the location of the property and the physical evaluation of the land. There are certain districts as affected by neighborhood conditions which are considered much more favorably by loaning institutions than others. The general environment is important; the trend of local development is considered; the existence of community facilities and mechanical improvements such as water, sewer, gas, electricity, etc., is thoroughly examined; the physical condition of the land is analyzed, together with local real estate valuations. In more than one instance architects have taken part in this and rendered important service to clients. Just because a client happens to own a given plot of land on which he intends to build a residence does not mean that he *should* build there. It may be that unfavorable local conditions exist or are developing. It may be that the location or the physical aspects of the particular plot are not suitable for the type of house which the client prefers. It is, therefore, quite possible that through the architect's suggestion a change of site may be found practical and desirable, and in this manner the project may be made much more readily subject to favorable mortgage financing.

The next consideration is given to the plans of the house. Here is where an extremely careful study is made primarily to eliminate two dangerous factors,—first, waste space which is uneconomical from the point of view of both owner and mortgagee, and, second, impractical building construction conditions as imposed by the plan. Here is where an architect has an opportunity to display both ingenuity and practical knowledge, because if the plan is efficient, a much more favorable appraisal will be rendered, and if it is not efficient, the mortgage application may be refused or the amount granted may be considerably less than the owner wishes to obtain. After the plans have been thoroughly analyzed, the element of design is given consideration, not from the æsthetic point of view but primarily from the *market* aspect. Is the house designed in such a manner that it will appeal to the type of prospective purchaser to whom it might ultimately be offered for sale? Is it designed in a manner suitable for its environment, and does the design offer a balanced ratio with probable construction costs? In other words, mortgage lenders realize that there may be waste or increased construction cost imposed not only in the plans of a house but also in its general design. If it is over-elaborate or if it calls for details which are inconsistently expensive, it will not make a favorable impression at the time when the loan is being considered.

After the plan and the general design have each received careful analysis, the next, and one of the most important considerations, is the question of specifications. Here as a rule the requirements of mortgage lenders are becoming constantly more stringent and more definite. The value of various building materials and types of equipment is known today and can be measured accurately. Manufacturers have done much to educate not only architects, contractors and owners, but also those who are interested in loaning mortgage money as to the merits of various materials. The particular points of interest include permanency and low maintenance cost as primary factors. The dwelling that soon begins to require replacements and shows comparatively rapid deterioration naturally does not constitute good collateral for mortgage loans. The banker is interested in the owner's ability to pay his interest, his amortization payments, and ultimately the principal of the mortgage, and he knows that if a dwelling is costly from the maintenance and depreciation point of view, the owner is in a less favorable position to keep up his payments. He knows, too, that even the quality of appearances after a few years has much to do with the appraised value of the property, and if a dwelling begins to look shabby and to show the need of repairs, thousands of dollars may drop off its market value. For this reason, the architect's specifications are in most cases quite thoroughly analyzed before the mortgage loan is made, and while some lending institutions may take the trouble to suggest changes in plan and in specifications, many of them will simply turn down the application or offer a smaller amount of money without any special explanation of the reasons. Specifications are, of course, analyzed also from the point of view of construction cost. The materials and equipment used should in the main be consistent with the general cost of the house. It is, of course, permissible for the owner to exercise his own judgment in the use of comparatively luxurious appointments, but these will gain very little recognition in the general appraisal of the dwelling, except where they might be in the nature of unusually good mechanical equipment, which has a definite utility value and which might function as an additional factor of value in the ultimate sale of the property.

It must be quite apparent that the architect in his service exercises a very definite relationship with mortgage financing, because in practically each division of appraisal, his function has its place and his work will meet with approval or disapproval. It must be remembered also that in appraising the value of property, those who are making an analysis in the way described in this article must sum up the total favorable and unfavorable points in relation to the land and its treatment, the house and its design, the plans and the specifications. The final total sum of impressions and facts forms the basis of the appraisal itself, and there may be a variation of thousands of dollars between two dwellings of equal cubic footage. Making the most of this variation is the architect's responsibility, and it is for this reason that he should thoroughly understand how mortgage appraisals are made and should constantly think of this ultimate test when he is developing each part of a project.

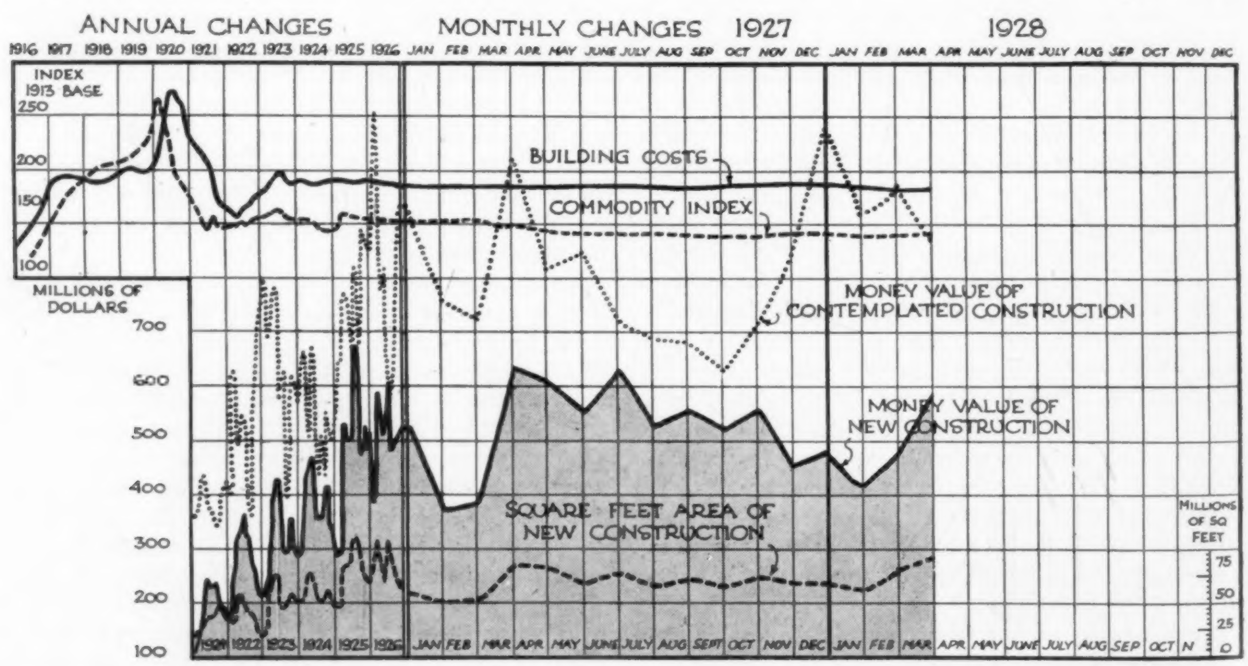
# THE BUILDING SITUATION

## A MONTHLY REVIEW OF COSTS AND CONDITIONS

IN spite of many predictions to the contrary, construction activity for the year 1928 has opened in record-breaking volume which bids fair to continue for at least the first half of the year. According to figures of the F. W. Dodge Corporation covering the 37 states east of the Rocky Mountains, there were contracts let for new construction during the first quarter of this year to the amount of $1,485,067,000, which is an increase of approximately 6 per cent over the amount of building started in the first quarter of the year 1927. This figure also represents the highest first quarter record ever established in the 37 Eastern states. A glance at the chart included here would indicate graphically the comparison of activity between this and other first quarters, and it becomes obvious that the year 1928 will add another record volume to the construction history of the last four years.

The new work contemplated, as indicated by plans filed, during the month of March, is considerably lower than the figure for March of 1927. The types of buildings for which plans have been filed are somewhat different and include a much larger number of institutional and commercial projects with a definite decrease in the amount of speculative building of both apartments and residences. On the other hand, the amount of building by owners for their own occupancy in the residential field is evidently increasing this year as compared with the 1927 figures. Contracts let during March amounted to $592,567,000, 46 per cent for residential buildings, 19 per cent for public works and utilities, 12 per cent for commercial buildings, and 6 per cent for educational projects.

Considering the plans which were filed for new construction in the month of March, as compared with March of 1927, we find these territorial changes which perhaps offer some basis for predicting trend of activity in the various districts. New York state and northern New Jersey show a 16 per cent gain in plans filed as compared with March, 1927. The New England States show an increase of 32 per cent; the Middle Atlantic States show a loss of 44 per cent; the Pittsburgh district shows a gain of 35 per cent over the contemplated record of March, 1927. In the Central Western States there is a loss of 44 per cent; in the Northwest a loss of 22 per cent; in the Southeastern States a drop of 54 per cent, and in Texas a drop of 35 per cent. It is probable that part of the unusual activity of the first quarter has been the result of an effort to let contracts early in order to partially avoid the usual spring buying activity.




THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Value of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp., and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost, which is determined, first by the trend of building costs, and second, by the quality of construction.

# PLANNING GROUP HOUSES FOR RENT

BY

RICHARD H. MARR, ARCHITECT

WE have seen, illustrated in our professional journals, numberless fine examples of residence architecture,—in plan, with exterior and interior views,—permanent homes of happy and (occasionally, perhaps) satisfied owners. Why not attempt further to endow with the same taste and completeness the homes of the great number, who of necessity must rent? When we erect a building to rent we are in a position akin to that of a merchant investing in a stock of merchandise, for we must please the public fancy and also make profit in the transaction. The one great point of difference, however, is the fact that the merchant may vary his next order in whole or in part through his knowledge gained by the previous sale and owing to any change in the trend of public desire. The builder, however, must so present his merchandise of land, buildings, and equipment that it will meet with the approval of the clientele for which his building is designed, not only one year but for each year during the expected life of the structure. It is, of course, assumed that the responsibility of the builder is not to be transferred to some unfortunate investor after the first group has tenanted the building!

For the purpose of analyzing this problem, we might consider the most usual type of building investment,—that of multiple housing, and a more specific and not as widely treated subject, that of the semi-detached dwelling,—the suburban brother (or sister) of the urban apartment house. The particular group used to illustrate this text was not chosen because of merit in the solution of the problem, but because it represents the average solving of the problem facing the investment builder. The questions which the author attempts to answer are not indigenous to any special location. The problem of financing will not be touched upon except to say that buildings erected as outlined here will, perhaps, bear a closer investigation and warrant a more favorable loan than those in which these apparently obvious, but often neglected, points have been overlooked or treated in a careless manner. Principal and interest must be paid from earnings, which in turn come from satisfied occupants. The three main divisions in order of procedure are: (1) choice of location; (2) plan and arrangement; (3) material and equipment.

*Choice of Location.* As the buildings illustrated would cost approximately the same in any part of a given area suited to their clientele, it is evident that a good location will complete a good scheme, or a poor location make good buildings unrentable. Assuming that an approximate decision has been made on the total amount to be invested, and a portion allotted to the purchase of a site, these details should be considered:

(a) *Permanence.* Is the adjacent property of suitable character and likely to remain so?

(b) *Competition.* The site should be selected to give the group a decided advantage over any similar project that might be contemplated in the neighborhood. An effort should be made to obtain property facing a park or open space, or with a decided advantage in regard to view.

(c) *Accessibility.* The site must be chosen with due regard to transportation facilities, street car service

Group of Fourteen Semi-Detached Houses, Detroit

Richard H. Marr, Architect

The Garages are Grouped Together

and good roads, streets or boulevards for motorists.

(d) *Good address.* The appeal of a fine, accepted residence avenue has a decided advantage over a short, unimportant street.

*Plan and Arrangement.* The great amount of contemporary material made available through advertising in the architectural press should assist one in developing almost any given type of plan. Bear in mind, however, that too great a difference in rentals in the same building is not advisable. Do not attempt to get a few extra dollars by putting mediocre or small apartments adjacent to those for which a considerably larger rental is asked. There are several considerations in regard to plan that are very important. A plan should be as direct and simple as possible. This not only saves in construction costs, but usually improves both the appearance and the utility of the rooms. The shapes of the rooms should be considered very carefully to make sure there is available space for the usual furniture of the people to whom the house will be rented. Rugs come in various more or less standardized sizes and will not fit well in rooms of unusual proportions or odd shapes.

Windows should be so placed as to not only admit ample light and air, but to leave adequate wall spaces at the corners of the rooms for the placing of furniture. Weather-stripping of the windows is often a very desirable feature. Some operators have found that the use of glass admitting the ultra-violet rays of the sun is very desirable in sun-rooms or certain of the south rooms, if possible. It is well to consult the booklet of the United States Bureau of Standards in making the choice of such glass in order to make sure that the glass specified really admits enough ultra-violet light to be worth while. It is

Street Front of Group, Showing Variation in Exterior Design

naturally necessary to keep the service entrances well separated from the main entrances of the houses, and to make sure that the service entrance for one house does not come close to the main entrance of another. It is well to build in as few equipment cases, etc. as possible, except in the kitchen. The individual taste of tenants is too varied to make much built-in furniture usable, and the unused bookshelves of the tenant who has no books are depressing as well as useless. The planning and equipment of the kitchen constitute one of the greatest factors in renting houses, as the mistress of the menage usually scrutinizes this very carefully and is a competent judge of the working efficiency of the kitchen plan and arrangement. The provisions in regard to servants' rooms should be commensurate with the living standards of the tenants. One must consider, also, the paths of travel of servants in order to plan for their work with as little interruption or contact with the household as possible.

In group houses built for renting it may be economical to have a central heating plant for the group. However, if there is any likelihood of the houses being sold separately, it is well to provide a separate heating plant for each house. Garage space must be provided for each tenant, and it is sometimes well to provide an extra garage or two for the use of guests of the tenants or for the use of the tenant who uses two or more cars. In the case of an apartment that rents for $300 or more a month, the family frequently needs space for two cars. On the general plan it is desirable to have a play yard or recreation space for young children, area well separated from the street in order to avoid accidents. Provision for the welfare of children is an important item in suburban groups of this kind. It is advisable

An Attractive Entrance Motif

Excellence of Design Enhances Rental Values

to provide a play room in the basement of each house or over the garage. The newer types of heating plants and the cleaner fuels often make possible the use of the basement as a play or recreation room.

*Materials and Equipment.* The choice of the materials for the exterior should be made with due consideration of maintenance cost as well as of first cost. Choose, if possible, materials which will age gracefully and which are not drab in color. The attractiveness of the exterior is the first factor influencing the prospective tenant, and first impressions are very often lasting. By all means, avoid use of the theatrical and the sham. This does not mean that color should not be used. It should be, but used with taste and restraint to make the houses attractive.

The equipment of the building is most important. The innovations and so-called luxuries of five years ago have become the necessities of today. It is well to introduce as many modern notes (of tested merit) as the rental will allow, as these items are desirable from the renting agent's point of view. A list of such equipment to be considered and specified, if possible, should include:

Mechanical refrigeration.

Thermostatic heat control.

Provisions for mechanical equipment,—washers, mangle, dryer, etc.

Resilient floors in kitchens.

Dining alcove furniture.

Ironing board provisions.

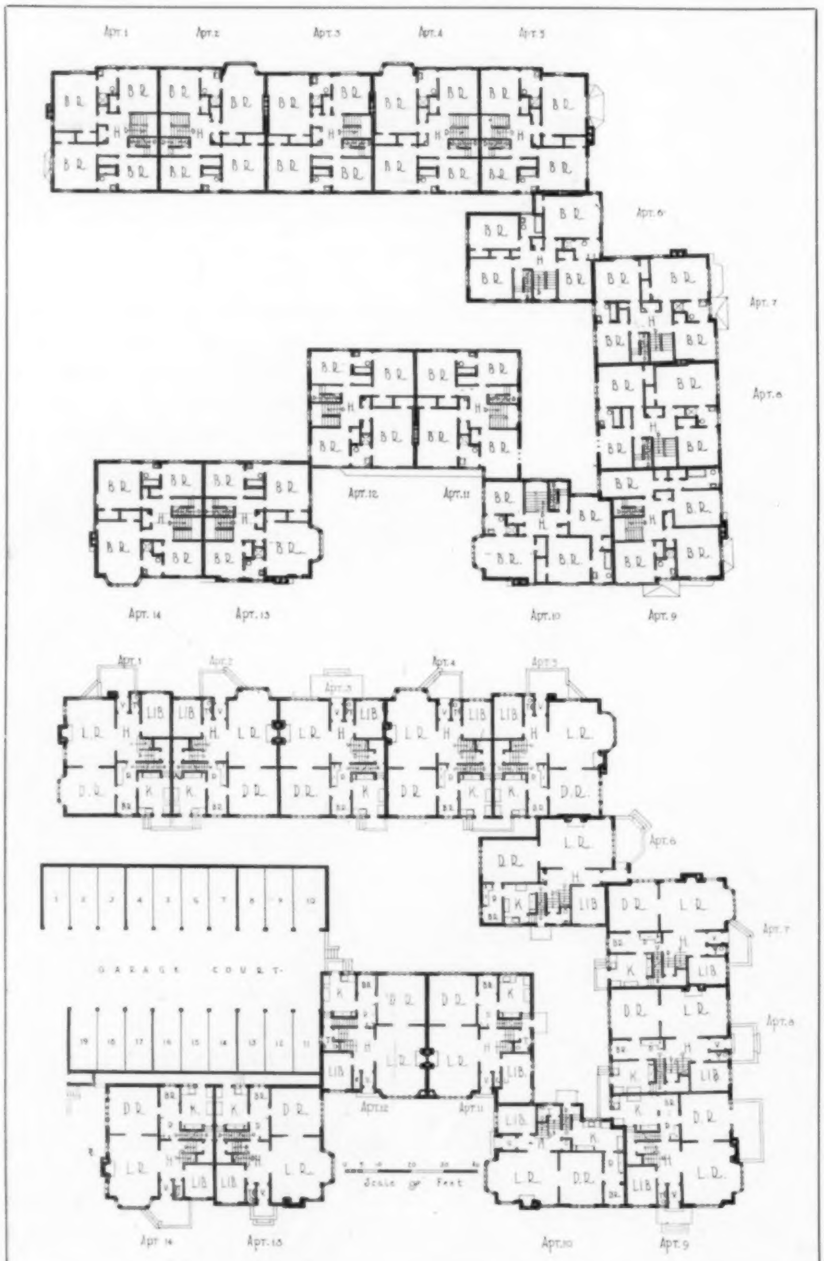
Built-in bathroom accessories.

Color in bathrooms,—tile and fixtures.

Cedar closets, etc., etc.

Ample electric outlets, including power outlets for cooking equipment, laundry equipment or electric heaters should be installed. Careful consideration must be given to the placing of base plugs to make them useful in connection with various arrangements of furniture. The wiring should be done with radio connections in mind. If these are provided in the initial wiring, unsightly and dangerous makeshifts will not be put up by the tenants. After all, this may seem to be a bromidic prescription, but it is the author's belief that a thorough study of the buildings most easily rentable and those most successfully operated will reveal the fact that most of the features enumerated here have been incorporated in the structures.

It is necessary for the architect to bear in mind constantly the desires and needs of the class of people who will be the tenants, rather than his own personal prejudices or desires. The owner of the development is usually informed in these matters, as he is in close touch with the local renting conditions and understands the requirements. The architect can fulfill these needs economically and efficiently and add his own good taste. He will always find that the requirements can be met without outraging good taste and good architectural design. It is his funtion to be the guide.



Plans of Group Illustrated
Richard H. Marr, Architect

# THE ARCHITECT AS CONSTRUCTOR

BY
WILFRED W. BEACH, ARCHITECT

THE present building boom in our larger cities has brought such a satisfying amount of business into the offices of most of the country's architects that it seems quite unnecessary to even suggest a question as to what tomorrow may bring forth. Yet the "tomorrow" of architecture is what most interests the younger men in the profession. Is the architectural practice of the future to mean a continuation of methods now in vogue, or will it be vastly different? If different, wherein will lie the variation? Architecture and building are so fundamentally interlocked that it is quite obvious that a change of procedure in either calling is bound to affect the other. Hence a study of the evolution of either must, perforce, be accompanied by due consideration of the progress of the other.

When our nation was young, it harbored few architects; and still fewer of those who called themselves such were worthy of the appellation, as is amply evidenced by such of their drawings as are still in existence, notably those submitted in competition for the capitol at Washington. For many years, construction work of the young republic was handled by four classes of individuals: (1) the architect, *per se,* more or less as of today, but of a quite limited sphere; (2) the "surveyor," forerunner of the modern engineer; (3) the "undertaker," who bid upon and undertook the construction of the concepts of the two first named; and (4) lastly, the "architect and builder," generally a country carpenter, by whom was performed the major portion of the building of that day.

Some have described the present-day architect as an outgrowth, the fruit, so to speak, of this latter group, but that seems hardly fair,—true only to a very limited extent. Rather, we of today are really the logical successors to those pioneers who lighted the way with a few conspicuous monuments which still remain, speaking evidences of their truth and sincerity. The "architect and builder" was more than likely to drop the first part of his title, thus becoming the "general contractor" of our day. And how have we architects kept our heritage? We elders have seen architecture expand from a comparatively simply affair of foundations, walls, floors and roofs to the present highly involved creation involving a vast multitude of things, many of which were unknown even to our immediate predecessors. We readily accept as axiomatic the assertion that it is humanly impossible for any single one of the *genus homo* to completely master *all* the intricacies of a large modern building,—but does each of us go as far as he may?

Thirty-five years ago the architect was undisputed "boss of the works." Does he occupy the same pedestal today? Then, no building project of any consequence, aside from the single item of bridges, was essayed until an architect had first been retained to design it and direct its construction. The complete architectural organization included men with sufficient knowledge of construction and the mechanical trades to design framing, heating, plumbing and wiring, in addition to the more æsthetic features of external appearance. But there came other architects, also of the first rank as to design and ethical status, whose practice did not warrant, or who did not choose to give, steady employment to men of exclusive engineering attainments. These architects found groups of engineers prepared to offer such service to all comers,—and the line of least resistance was readily pursued. Soon it came about that such engineering concerns were learning to solicit direct the designing of factories and warehouses, buildings which did not appear to demand embellishment,—"architecture," as by some considered. Next in the progression was the employment by such engineers of architectural designers, where these were demanded, to supply a needed touch to the otherwise simple mass. Whether the modern engineer has graduated from the ranks of the old time land surveyor and bridge designer or whether he is a direct offshoot of our own profession, makes little difference. He has become a powerful factor to be reckoned with in the acquisition of new business. To the small city practitioner this defection of industrial construction has not been of much moment. Whether such work be carried out by a distant city architect or engineering "specialist" worries him not at all,—it is not his funeral. Smaller fry "have smaller fleas to bite 'em."

For instance, there was a time when the stable "pot boiler" of the small office was the country home, costing from $5,000 to $10,000. The planning of these carried no direct profit,—even at a fee higher than the American Institute's minimum,—but they enabled the town architect to steady his small organization, and they increased the circle of his clientele. Much of this business has gone by the board with the inauguration of the Architects Small House Service Bureau. Presumably, this service has filled a "long felt want," so one must not quarrel with it. It merely takes its place with others among those things which have to do with the changes in office practice that have been and are still going on. True, the actual number of houses built from the Bureau's working drawings is probably proportionately small; but these drawings have furnished inspiration for countless others,—copies of which can be had at any lumber yard,—and which, by the way, are vast improvements over the comparative few that were in existence before an organization of architects added to the marketing of ready-made drawings and plans.

But the growth in the influence of the engineer and the influence of the ready-made plan on the volume of work in architects' offices pales to insignificance when compared with the steady advance into our field of the modern general contractor. This entity, formerly a willing and earnest bidder for the architect's favors and working under his supervision, has now become a most formidable rival in the securing of business direct from the owner, getting, in short, the planning of the work in order to be sure of getting its construction. Frank N. Watson, Secretary-manager of the Dallas Associated General Contractors, deals candidly with this situation. He speaks quite frankly of the demoralizing effect on building in general of the operations of the shyster and the novice in both architecture and contracting, and repeats the oft-reiterated complaint against awarding building construction by competitive bidding. He further says: "In too many instances, even the architect who appreciates his professional obligation permits himself to be over-ridden by the demands of the owner, and stands idle while the owner indulges in the common pastime of 'whip sawing' the three low contractors, or disregards his own interests by buying construction on price alone." This we all admit, and we also know to our sorrow that "entirely too many contractors, who make claim to skill, integrity and responsibility, are bidding for the profit instead of for the contract and are giving their 'subs' and 'dealers' the same or worse treatment than they complain of on the part of the owner and architect."

Well, why shouldn't they? If we consider only those offices which have never mistreated a contractor nor permitted a client to do so, can we find therein any fundamental reason that should lead a contractor to make a building better, simply for the love of that building? No, that is the sole privilege of the architect! The contractor is to make the building good because he is compelled to do so and for no other reason. In fact, he could not be depended upon to make it good without being hedged about with restrictions that prevent his doing otherwise. Such is the being created by our building contract. Nevertheless, our practice is so predicated on the custom of competitive-bidding contracting that we remain its sponsor and will probably continue to do so. We do not willingly try to educate the owner to other methods. We know full well that there are no ethical standards in such a game, and we write our specifications and contracts accordingly. Then, after the contracts are let, we accept the post of paid detectives and try to keep the contractor straight. Do we keep him so? Mr. Watson believes (and it is probably quite too true) that "any experienced contractor will admit that the leeway between good and bad afforded the contractor by the ordinary set of plans and specifications is not seriously impaired by architectural supervision; that the unscrupulous contractor, or even the ordinary honest contractor, faced with a possible loss through a price-competition, forced bid, can find many ways to skimp his work,—giving construction that will pass the eye of the average inspector, but not giving the owner the quality he wants or thinks he is getting." This from the contractors themselves! But, suppose a builder of character and commensurate reputation has opportunity to serve a friend who wishes to build and wants him to do the work? "Even then," Mr. Watson complains, "by reason of the fact that our industry cherishes a taboo that design and construction are inviolably separate, the contractor must turn the prospective owner over to an architect who cherishes the same taboo, and the project usually ends in the same old free-for-all competition, and 'price' emerges the victor."

Discouraging this, for a builder who has the interest of a prospective client at heart and who steers him to a good architect. Why shouldn't he instead, if his initial hold on the owner be sufficiently strong, hire a good designer (away from some architect, if necessary) and execute the whole work as he knows it should be done and in a way that he and the owner may both take pride in? That's exactly what he's doing today,—and he's going to do it more and more often as the days go by. "Truth endures",—perhaps more fully in architecture than in some other fundamentals. Are we building with truth when we make use of unworthy vehicles, questionable materials and unrighteous intents? Competitive-bidding contracting is a relic of the day of *caveat emptor*. Why should the architectural profession collectively strive to maintain that iniquitous slogan when all the better class commercial world is seeking to place all business on a higher plane? Is it not natural for the business of building to follow suit, in spite of the architect? Then may we expect Mr. Watson's conclusion: "But, in the main, future construction work will be handled by firms which unite in one organization the functions now separately performed by architects or engineers and contractors."

Who may this entity of the future be, who is thus to combine the former distinct functions of architect and builder? Obviously, at the start, it is whoever first occupies the field. To an alarming extent, we find the contractor already there. But, is the field rightfully his? To a very large degree, his ability to sell his services in the dual capacity has been aided and abetted by a most powerful ally,—his willingness to finance, as well as to design and build the projected structure. It is in this line of endeavor that the large builder, operating his own architectural and engineering departments, has found the greenest pastures,—the ripest fields. Such a concern, functioning through a reciprocal agreement with a powerful bond house, wields a potential lever under that unassigned project. Even if the tradition be observed and an independent architect be favored, his retention is by sufferance of the builder, over whom he exercises no control whatever. If architects are to compete with this formidable protagonist, they must either equip themselves accordingly or find other points of advantage to aid them

in securing the business. It is very largely a selling proposition, pure and simple; a setting forth of the qualifications of the seller of services. To begin with, the architect finds himself possessed of one worth-while asset which connotes a corresponding weakness in the armor of his rival; he is a subscriber to a well defined code of ethics. No matter what one may think about this or that particular architect who is alleged to have side-stepped the code, the fact remains that the public has a sufficient respect for the standard of business dealings of the profession at large to hold such a transgressor to be an out-and-out crook, whereas a contractor may do those same things and worse, and be regarded merely as a shrewd business man.

Naturally, the architect's most ready entry into the construction field is by means of some form of cost-plus building. The solicitation of building construction without a guarantee of cost presupposes the highest type of salesmanship,—and architects pride themselves on being poor salesmen. They,—the best of them,—are sometimes heard to say that they never went out after a commission. Well, be that as it may, this article must be for those others who are willing and eager to expand; whose joy in the conception of an appropriate design can best be completed by the greater inspiration of the actual creation of the thing of materials enduring, that shall make the ideal real. Nor need such a one be deterred by Mr. Watson's showing of the scant profits in building construction. After saying that "statistics recently compiled from data in the Bureau of Internal Revenue show the average profit of general contractors to be only 2.1 per cent," he adds his impression that, if consideration were given also to those whose business was insufficient to demand a government return, "the 2.1 per cent is certainly 50 per cent high." That is, he thinks the average profit might be about 1.4 per cent.

But we need not reckon with these smaller fry, as they are proverbially poor business men, the majority being "carried" by the local lumber yards which reap the real profit, secure behind the mechanics' lien laws. Even the 2.1 per cent makes little if, as is generally figured, it depends on volume of business. A contractor with $50,000 capital can readily handle $2,000,000 worth of work a year, on which 2.1 per cent figures $42,000,—not a bad return on the investment. But, in cost-plus building, where there are no losses to be charged off, and where the actual capital needed is proportionately less (say about 1 per cent of the gross business), the profits are, as for other forms of service, more of a return on energy expended than on actual financial investment. The building owner "carries" the operation. It is his deal, already financed. Why should he pay a high rate of interest on someone else's funds during construction, when his own have been set aside for the purpose,—are either idle or drawing a low return? If the builder is to have a hand in the financing, that is another matter. It then becomes a subject of too many sides to be dealt with here and now. In any event, the financing should be segregated from the building construction and paid for as an independent factor; otherwise both may be found to be costing the owner inordinately.

One dispenses also with the incubus of fixed-price contracting, the 1½ per cent "thrown away" on a bond. As a matter of fact, an architect, upon first entering the building field, is more than astonished at the savings he can effect,—can turn back to the owner as part of the reduced cost of safe and sane building over that of cut-throat contracting. In a measure, the general contractor has "cooked his own goose" in the cost-plus game by the opprobrium brought upon it by his very lack of ethical procedure therein. Unless he can convince the owner that he himself is an exception (admitting that his competitors are not to be trusted), he must either be backed by the financial interests bonding the project or must have recourse to super-selling propaganda. In the last instance, he is likely to add a maximum guaranty to his offer,—and the owner is landed, tied up in a deal whereby the builder is both contractor and judge of what that contract is supposed to include, without price competition. This situation is always puzzling to an architect, who can with difficulty conceive how an astute business man can allow himself to be inveigled into such a palpable swindle. The answer is, —superior salesmanship. Nor is the salesman necessarily dishonest, though he may prove his employer to be. If the owner is so supremely foolish as to entrust cost-plus work to someone in whom he hasn't absolute confidence, perhaps he deserves to reap the proceeds of his own imbecility. *Caveat emptor!* And the warning is quite apropos in modern building, unless the prospective owner is careful to assign his work only to a firm of known integrity.

Let us cite, briefly, some actual instances. "A" was a banker who "fell for" the elaborate advertising of a concern grown plethoric with gain on such victims. The ordinary architect might not serve him, nor yet one extraordinary. He had so educated himself on biased propaganda as to believe he wanted a single entity to take all the building worry off his hands down to the inkstands on the counters. He couldn't see that that was exactly what any dependable architect would prefer to do, if permitted. But he got what he wanted, *plus*. The contractors were to get "cost, plus 10 per cent, not to exceed $67,500," and made much of an assertion that they had once turned back over $3,000 under such a contract. When this project was finished and the banker demanded a statement, all he received was that of a "certified accountant" to the effect that, inasmuch as the guaranteed maximum did not allow the builders the 10 per cent to which they would otherwise have been entitled, no further statement was necessary,—and none was forthcoming. Referring to his contract, the banker found that it called for "a statement," but that nothing was said about its being detailed or itemized.

That the building could have been reproduced for less than $40,000 was amply proved by the experience of "B," another banker in the same town who built a year later, in the same block with "A." Costs were slightly higher; his building was exactly half as large as that of "A." The same builders offered the same kind of contract, with a guaranty not to exceed $36,000. But "B" didn't think that "A" had fared any too well, and he looked up an architect who wanted the work, but wouldn't solicit it, wouldn't cut his price below the American Institute rate, and wouldn't guarantee the cost,—"quite evidently a poor business-getter." This architect had planned other banks of the sort and had the best of references, as the banker's investigation proved. He thought the building could be produced for under $22,000, and submitted an itemized estimate in support of his theory. The owner employed him, and the work which the architect had estimated at $22,000 was executed for under $21,000, and is at least 25 per cent better than that in "A's" building.

"C" was a banker in a distant city, solicited by the same concern that had built for "A." But "C" was a perspicacious individual, who could at least see through ordinary glasses. Marvelous salesmanship and extravagant advertising fell upon barren soil. He sought an architect experienced in bank work and discovered one with a construction division in his organization. But, when that architect said "cost-plus," he found he was "waving a red flag at a bull." The memory of much ill-used privilege, which had masqueraded under that title, was fresh in the mind of the wide-awake Mr. "C." However, after thoroughly investigating this architect's past performances, he employed him for architectural services only, freely asserting that "no cost-plus-everything-else-possible builder would get a chance to stick a harpoon into him and twist it." But his troubles were not so easily disposed of. His appropriation was $60,000, and his architect's estimate was $65,000. Bids, solicited by the cautious banker, elicited a minimum of $66,000 for the general contract alone. Impasse! There remained the heating, plumbing, wiring, bank fixtures, marble work, vault equipment decorating and numerous other *et ceteras,* for all of which the architect thought an additional $25,000 or $30,000 would be required. After several weeks of hesitancy, during which prices were steadily trending upward, the unfortunate banker allowed his need to over-rule his better judgment, closed his eyes and signed, "on the dotted line," a wide open contract, whereby his architect was to deliver the building which he had planned, and would be paid "cost, plus a lump sum." The portion of the work, for which the low bidder had demanded $66,000, was done for under $40,000, and the entire building turned over complete, within the estimated total cost. These are isolated instances, cited to prove nothing, but rather to indicate that an architect need not be timid about entering the practical building field.

Model of the Civic Center and Municipal Building, Denver
Allied Architects Association of Denver, Architects

# OFFICE PRACTICE

## THE ALLIED ARCHITECTS ASSOCIATION OF DENVER

BY

ROBERT K. FULLER, PRESIDENT

TO complete plans for the development of Denver's civic center and to provide architectural service for the proposed municipal building of Denver, were the principal objects which led to the formation of the Allied Architects Association of Denver. It seemed appropriate and feasible that this service be undertaken as a civic enterprise by the Institute architects of Denver because of widespread interest among members of the profession. The project contemplated by the city involved the expenditure of $5,000,000 for the proposed municipal building, and the erection of this structure will form the major development of the civic center. The importance and responsibility of the architectural service necessarily required a high standard of excellence.

After careful investigation, the Colorado Chapter, which sponsored the enterprise, became satisfied that a properly organized association of architects could render the service required. Such an organization would permit of the selection and functioning of specialized groups, directing respectively the problems in plan and design, construction and engineering, and construction supervision. The proposal of the architects was received with favor by the city of Denver, and as a consequence the Allied Architects Association of Denver was employed by the city to render the service proposed. The membership of the Association includes all Denver members of the Colorado Chapter of the American Institute. The Association functions as a coöperative organization, incorporated under the state laws, and is governed by a board of seven directors. To render the service for the municipal building, a separate office organization was set up, and it has functioned similarly to that of any large firm of architects. Problems arising in plan and design, in construction engineering, and in construction supervision are reviewed by the respective committees on these subjects. The active direction, control and responsibility of the organization rest with the board of directors, to which all committees report. A member of the Association may enter the drafting room, if the need of such employment arises, but upon entering the drafting room his status becomes that of an employe only. Members are privileged, and were required at the beginning of operations, to submit preliminary sketches for the design of the building, and from this procedure much valuable information was procured for the later development of the scheme.

The work of the Association has proved of great interest to the members, and the coöperative character of the service has insured unity and harmony in the affairs of the Association. The working drawings and specifications have been fully completed and have received the official approval of the Denver Art Commission, the Mayor and the City Council of Denver. The Supreme Court of Colorado has recently rendered a decision clarifying certain phases of legal procedure in the awarding of contracts, and it is now contemplated by the city that the actual work of construction on the municipal building shall begin within the next few months. The construction of the building will probably require three or four years' time, and when the service is completed the principal object of the association of architects will have been accomplished, and it will then in all probability disband.

The Allied Architects Association of Denver is committed to these principles of operation, which make it unlike other associations and which may be briefly summarized as:

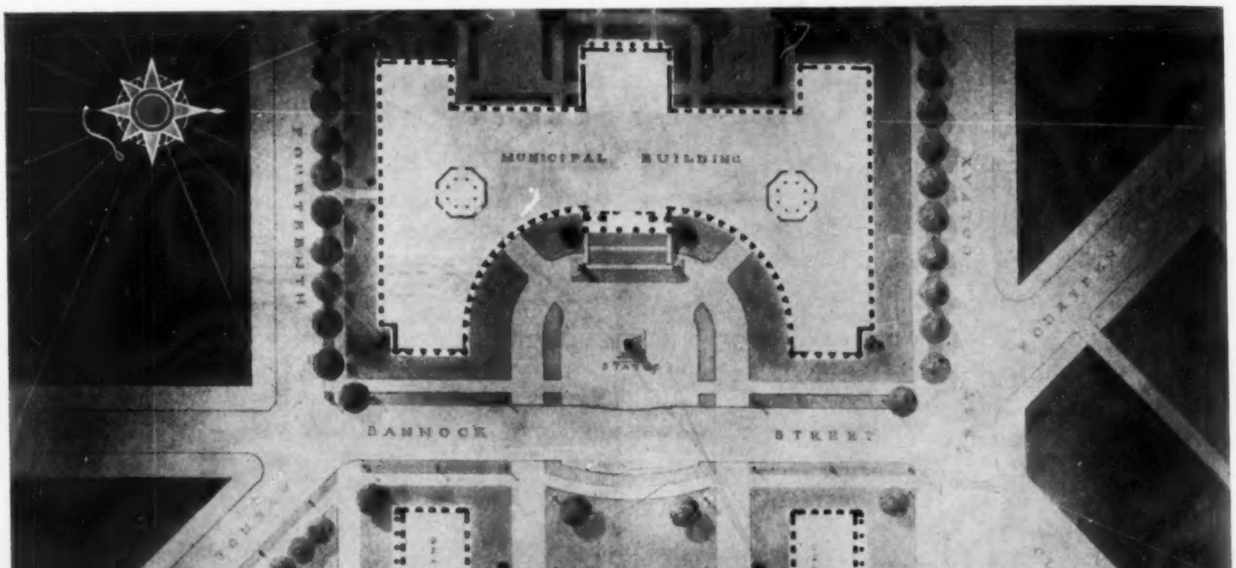
1. Dealing with a single work,—a civic center and municipal building.
2. The adoption of a policy of non-interference with the private practices of its members.
3. Carrying out an enterprise undertaken by the profession in the interest of civic responsibility by the Institute architects of Denver, sponsored by the Colorado Chapter of the Institute.
4. The purpose of the Association to conserve profits, in order that, upon completion of the work, such funds may be administered for the benefit of the profession in Colorado.

The success of the Association in its work may be attributed to these dominant characteristics:

1. The urge of civic responsibility accepted by the architects.
2. A service well coördinated and fully representative of the Institute architects of Denver.
3. The altruistic purpose concerning disposition of accrued profits.

Enduring benefits have already been attained in the profession from the unifying influence of a constructive work undertaken for Denver by the members of the Association. As a consequence, the Chapter's prestige has been elevated to new significance in municipal and state affairs. In recognition of this influence, members of the Institute are now serving on the State Examining Board of Architects, the Colorado Engineering Council, the Denver Art Commission, the City Zoning Commission, and the Denver Smoke Commission, in addition to having active representation in the Chamber of Commerce, the City Club, and various other civic organizations.

ELEVATION, CITY AND COUNTY BUILDING, DENVER




PLAN OF THE CIVIC CENTER, DENVER
ALLIED ARCHITECTS ASSOCIATION OF DENVER, ARCHITECTS

# THE ALLIED ARCHITECTS ASSOCIATION OF KENTUCKY

BY

OSSIAN P. WARD, PRESIDENT

THERE had been considerable discussion as to the forming of an Allied Architects Association of Kentucky. This was brought to crystallization and consummation by the opportunity to design some buildings for the University of Louisville. On March 31, 1925, the Allied Architects Association of Kentucky was incorporated under the laws of the state of Kentucky. This Association was organized primarily for the advancement of architecture in connection with the designing of public buildings, and not for the profit of its members. Quoting Article I of the by-laws: "The paramount purpose of this Association is to advance the art of architecture, and by professional coöperation and collaboration to secure for and provide municipal, county, state and national governments and organizations formed for civic betterment or mutual or business advancement with the highest and best expression of the profession of architecture at the least possible cost in the design and constructlon of buildings, structures and improvements." This organization will not accept commissions or perform architectural services for private individuals, firms or corporations.

The board of directors, of whom there are five, elected by the members of the Association, have the power to fix the compensation to be paid to its officers, representatives and employes. In the month of January of any year, the directors can at their discretion divide the profits acquired by the Association among the members whose membership has been continuous for a period of one year prior to the date of said division. So far there has been no division of profits among the members of this Association. The conducting of the architectural work of the Association is carried on very much as it would be in any architect's office, except that the board of directors, instead of the individual architect or partners of a firm, manages all the affairs of the Association. The field of endeavor, however, being limited to public buildings, is very much restricted.

The board of directors selects the members best suited to take charge of the different branches of the work, and employs draftsmen and outside help whenever necessary. In connection with the only work that the Association has had to date, the board of directors became the executive committee and had charge of the preparation of plans and specifications and the supervision of the construction, holding frequent meetings during the progress of the work. It is not the intention of the Association to cut commissions or compete with architects outside of the Association, except, of course, in the field of public buildings, and even in this field there is a disposition to give the individual architects first chance, or at least every opportunity, to obtain the commissions.

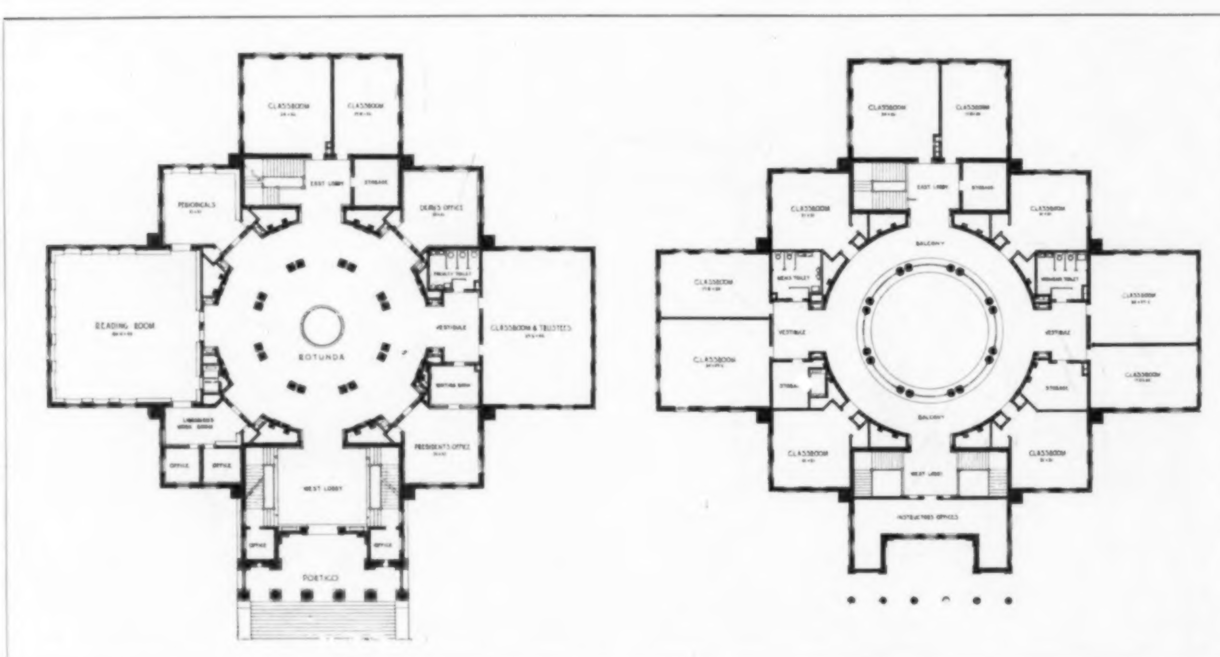
A complete set of books is kept, and also a record of the cost to the Association of conducting the various branches of the architectural work. The question of legal responsibility is very important, and one that I may not be able to answer properly. So far there has been, in our experience, no occasion to decide any legal responsibility, but it would seem

Administration Building, University of Louisville
**Allied Architects Association of Kentucky, Architects**

that what would apply to any other corporation in Kentucky would apply to the Allied Architects Association, incorporated under the laws of Kentucky. In our articles of incorporation it is provided that "the highest amount of indebtedness and liability which the corporation may at any time incur shall be $30,000," and also that "the private property of the stockholders of the said corporation shall not be subject to any extent whatever to the payment of the debts and obligations of the corporation." The laws of Kentucky require that every corporation shall own capital stock, so each one of the 11 members of the Association owns three shares of stock of par value of $33.33 each. No person shall own more or less than three shares of stock in this corporation, and every member has the same rights.

At the outset it appeared as though the University of Louisville would have $500,000 or $600,000 out of a bond issue of $1,000,000 to expend for new buildings, and the Allied Architects Association obtained the contract to erect three buildings for the University. Unfortunately, the resultant funds dwindled, and so far the Association has designed only one building,—a new administration building, for the University of Louisville, costing, with driveway, approximately $300,000. As this is the only work that the Association has performed, its success or failure must necessarily be rather limited. The building itself has been quite generally commended, and we hope will satisfactorily fulfill its purpose. The relations and associations of the various members of the organization working upon this project have been cordial, friendly and enjoyable, and it seems that there are many beneficial features in such an organization, provided enough work can be obtained to permit proper organization and to hold the interest and coöperation of the members. On the other hand, there seems to be a difference of opinion, even among the members of the organization, as to the possibility of such an organization's working efficiently and satisfactorily. Our organization has been and still is in an experimental stage, and its future success or failure is dependent upon enough work to keep the Association together and interested; for no organization can endure and properly function without something to do. It also requires a leader who can devote considerable time to the affairs of the organization,—one who can inspire the members and arouse their interest and loyalty. Much can be done, and great benefit can be derived by the members of such an organization, provided that it is properly organized and governed. The things that militate against the success of such organizations as allied architects associations, are the complexity of modern life; the busy and crowded hours of most architects, which make it hard for them to devote much time to anything outside of their routine business; and the fact that it is harder for a group to come to a decision and function than for an individual.

In conclusion, in my humble opinion, an allied architects association may be very successful provided it is properly organized, led and has plenty of work. On the other hand, there can very easily be failure if there are little work and lack of leadership and interest on the part of the members. On the whole, it would seem that the advantages in an association such as this outweigh the disadvantages, and that bringing competing architects together into a group working for the same cause creates and fosters cordiality that would not otherwise be obtained.



Plans, Administration Building, University of Louisville

Allied Architects Association of Kentucky, Architects

# CHARGING FOR PROFESSIONAL SERVICES

## THE COST PLUS SYSTEM OF ROBERT D. KOHN AND ASSOCIATED ARCHITECTS

BY

MAUD M. ACKER

Editor's Note. In the April issue of The Architectural Forum, William Stanley Parker wrote of the "Fee Plus Cost System for Architects," as employed in the office of R. Clipston Sturgis, Architect. Mrs. Acker describes the interesting cost-plus system used in the office of Robert D. Kohn and Associated Architects, which differs, in some respects from the method described by Mr. Parker.

WE have used the cost-plus charge for professional services in our office for many years and have found it works out to the advantage of the client and to our own. The form in which we write to clients is substantially given here:

"As you know, it is the usual practice of architects to charge a fee based on a certain percentage of the cost of the work executed. This has worked fairly equitably in the past. But in view of changing prices and other conditions it may not always work equitably now for both owner and architect. We have therefore in recent years proposed a plan to our clients which bases the payments to be made to us as architects entirely on the actual cost of the work we do, plus overhead and a reasonable profit. We protect the owner against any excessive cost by placing an upset maximum price. The owners pay us monthly for the amount of work done for them in the previous month. If the work goes along smoothly and no extraordinary complications arise they are likely to pay for our service a lesser total sum than would be involved under the old percentage rate of charge. If, on the other hand, the work is complicated or delayed by unusual conditions that arise, or if changes have to be made which involve additional drawings, the cost is more. But there is never any question as to what the amount charged should be, since the whole matter is based on actual expenditures in our office. The scheme which we propose for your building is as outlined in the next paragraph.

"We are to give full professional services including all the usual plans, details, specifications and superintendence for this work, and we are to receive as compensation therefor the direct cash expenditures of our office in the payment of the salaries of our staff and other assistants of any character for necessary work done while engaged on this project, plus 66⅔ per cent for overhead, plus a charge for the time of the principals charged for on a salary basis when the time of the principals is devoted to this work, plus fees paid to structural engineers, plus one-third for profit, plus the net cost of blue prints and cash expense incurred for long distance telephoning, traveling expenses, etc. We hereby agree that the total amount which you will thus be required to pay us will not exceed the basic rate of .... per cent of the proposed cost of the building work, as a basic fee of that amount would be calculated under the normal conditions of practice mentioned in the latest schedule of the American Institute of Architects."

Our cost on an imaginary case would be kept in this way:

| | | | |
|---|---|---|---|
| Draftsmen's time ....... | $100.00 | | |
| 66⅔ overhead .......... | 66.66 | | |
| Total ............. | $166.66 | $166.66 | |
| Principals' time (hourly salary basis) ......... | $ 50.00 | | |
| Engineer's fees ......... | 50.00 | | |
| | $100.00 | $100.00 | |
| | | | $266.66 |
| 33⅓ profit ............ | | | 88.88 |
| Blueprints ............. | | | 30.00 |
| Cash expense .......... | | | 4.46 |
| | | | $390.00 |

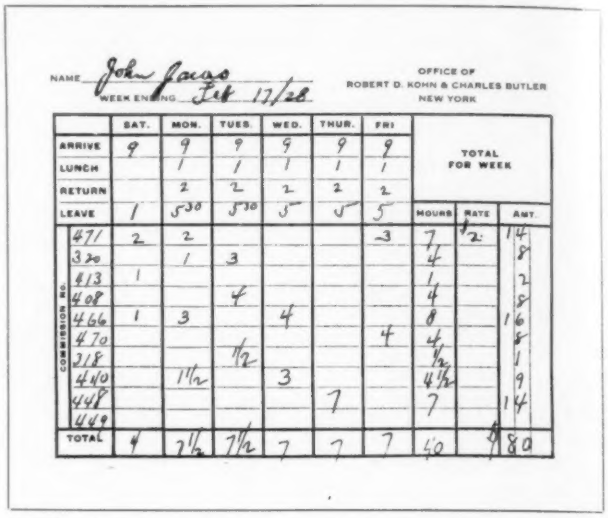
We have often been asked how the principals keep a record of their own time and what they charge as their salaries. It will be noted that the scheme as defined in the contract includes in the cost of production the time spent by the principals. Each of the principals keeps a separate time sheet, just as do the draftsmen. To be sure, it is impossible for the principals to find more than half of their actual working time that can be directly entered on the time slips. This is due to the fact that it is impossible to charge up time spent in telephone conversations, dictation and general office supervision. A careful record kept for the better part of a year shows that the average is just about one-half of the number of working hours. That being the case, the principals' time entered for each commission is doubled. We have also been asked how we arrive at our overhead. We find that our costs for office rent, stenographers, materials, telephones, telephone operator, office boys, printing, etc. (all the unassignable costs) averaged for a number of years 66⅔ per cent of the amount expended in the same years for directly assignable salaries of draftsmen and superintendents. In busy times the overhead is less,—at other times more. We have therefore thought it right to take the average of a number of years as a constant to be applied to every project in figuring the overhead. If a surplus accumulates under this heading in one year, it should be retained as a reserve fund to meet the deficit of another.

Aside from the overhead, an item of profit had to

be determined on. It was quite customary to assume formerly that something like 40 per cent of the total fees collected ought to be profit to the architect, the profit being the total amount which the architect himself was supposed to receive as clear of all expenses. Some architects claim that half of their total fees are profit, but we believed that to be exceptional, and that in the general run of work the expenses of a commission amount at least to 60 per cent. But in the instance given here the profit is calculated on a cost which includes the architect's salary. Accordingly, after considerable calculation and discussion, we reached the conclusion that 33⅓ per cent would be a reasonable profit item to charge when based on such inclusive costs.

There are two or three considerations which are of importance in this cost-plus scheme. The first is that any waste in the office on the part of draftsmen or carelessness in duplicating work is naturally to the detriment of the client, just as would be waste in a cost-plus contract for building construction work. Though the owner is protected by the upset percentage fee, it might be claimed that there is still leeway enough for considerable waste, since we always make this upset maximum 1 per cent more than the usual Institute percentage fees. That is a valid criticism. It is up to the office unquestionably to guard most carefully against waste. We have found in our experience that on several occasions we felt called upon to credit an account with the salaries of men who had for one reason or another neglected their work or failed to produce drawings that were of value to the client. Such items are charged back against the profits of the office. In every such case the men in the office are informed of the items, so that they realize that this is a charge against their shares in the profits. The scheme of charging a distinct item for profit sets aside a certain fund which can be divided under a profit-sharing scheme with the whole office force. The architect himself has been paid a salary, an amount at any rate which gives him some return for his services, even if not an entirely adequate return. It is therefore simple to work out a profit-sharing scheme in which the workers can share in a reasonable ratio to the amount of profit.

The next important point is that the architect does not benefit by receiving an enormous fee on work that is simple, where the client makes few demands and where the work is repetitious; but he does not lose large amounts where the client is difficult and the work complicated, as is the case with some residential work. A New York architect in criticizing this scheme to Mr. Kohn one day said: "Your plan may be all right, but you can never make a killing"; to which was replied: "We do not have to make a killing, since under our scheme we make no loss on any commission." Under our plan an architect does not profit inordinately on one project and give his work away on another. The client pays for exactly what he gets. Another advantage under this scheme is that each month, the first of the month, a bill is


NAME John Jacas
WEEK ENDING Feb 17/28

OFFICE OF
ROBERT D. KOHN & CHARLES BUTLER
NEW YORK

| | SAT. | MON. | TUES. | WED. | THUR. | FRI | HOURS | RATE | AMT. |
|---|---|---|---|---|---|---|---|---|---|
| ARRIVE | 9 | 9 | 9 | 9 | 9 | 9 | | | |
| LUNCH | | 1 | 1 | 1 | 1 | 1 | | | |
| RETURN | | 2 | 2 | 2 | 2 | 2 | | | |
| LEAVE | 1 | 5³⁰ | 5³⁰ | 5 | 5 | 5 | | | |
| COMMISSION NO. 471 | 2 | 2 | | | | 3 | 7 | $2 | 14 |
| 320 | | 1 | 3 | | | | 4 | | 8 |
| 413 | 1 | | | | | | 1 | | 2 |
| 408 | | | 4 | | | | 4 | | 8 |
| 466 | 1 | 3 | | 4 | | | 8 | | 16 |
| 470 | | | | | | 4 | 4 | | 8 |
| 318 | | | ½ | | | | ½ | | 1 |
| 410 | | 1½ | | 3 | | | 4½ | | 9 |
| 448 | | | | | 7 | | 7 | | 14 |
| 449 | | | | | | | | | |
| TOTAL | 4 | 7½ | 7½ | 7 | 7 | 7 | 40 | $ | 80 |

TOTAL FOR WEEK

Weekly Time Card Arranged for Charging Directly Against Commission Numbers

rendered to the client for the expenditures of the previous month, plus overhead and profit. Without exception our clients have become accustomed to this plan and pay these bills promptly, and the whole financial health of the office has been improved since we do not run credit accounts. The old habit of borrowing money from the bank to carry on commissions is gone, we trust for good. Just as a reform, it would be well if the whole architectural profession adopted the habit of sending monthly bills, whatever might be the system of their charges. At the beginning of a project the client is always comparatively flush and is ready to pay bills, while otherwise, under the old plan, the architect has been the last one to be paid, because the client is often short of cash after paying the contractors. Under our scheme of monthly bills the greater part of the architect's fee is paid long before the contractor gets in his final work.

This outline of our plan is a somewhat revised and corrected statement of the working of our cost-plus plan as prepared by Mr. Kohn some years ago. Considering it now in the light of more than eight years' experience, we would not change back to the percentage basis under any circumstances. We have to acknowledge that once or twice we have come out badly on commissions, despite the cost-plus basis. The reason was that we fixed too low an upset percentage. In one case, on a hospital built at a remote point, we made a contract on the cost-plus basis with an upset percentage of 8 per cent plus traveling expenses and cost of a clerk of the works. Owing to a disagreement between the members of the medical staff, the work stretched over a great length of time and the costs ran inordinately high. But we maintain that had this been a straight percentage commission, the story would have been the same. It happened to be one of those cases where it was hard to prove, without going to court, that the nature of the changes imposed upon the architects justified extra compensation.

# CUBIC FOOT COSTS OF BUILDINGS

BY

JAMES E. BLACKWELL, ARCHITECT

THE practical man always wants a "thumb rule"; speed is the demand of modern life; there is often no time for long calculations, and we begrudge the time it takes to make reliable estimates. As a draftsman once said, upon hearing a client's demand for speedy work, "a man will take a year to decide whether he will build or not, and when he does decide, he wants the plans finished day before yesterday." There is no short rule uniformly accepted as reliable in estimating the cost of buildings, and many times what is called an estimate, is what an old architect called "a mere *guesstimate*." There have been in use the methods of cost obtained by the cubic foot; by the square foot, or floor area; and by the room. Of these the cost by cubic foot seems to be the only one *approximately* reliable and used generally and for many years.

*The cost by floor area* is obtained by measuring the aggregate area of all the floors and dividing the total cost of the building by the total number of square feet. To get the approximate cost of a proposed structure, its floor area is multiplied by the cost per square foot of an actual building of the same type recently completed.

*The cost by number of rooms* is used by taking a building of known cost and rooms; dividing the number of rooms into cost, to ascertain the cost per room. This cost can be used as a constant in multiplying the number of rooms in a proposed structure to obtain the approximate total cost. This is the most unreliable of the three methods mentioned, as the cost per room may vary from $500 to $2,000 or $3,000, depending upon the sizes of the rooms and the materials of which the building is constructed.

*The cubic foot method* was brought to this country from Great Britain and has been in use some 50 years or more, and so far as the writer knows, a table of costs and explanation thereof was first published in 1887, giving the cost per cubic foot of some 38 selected United States government buildings of various classes and materials of construction, ranging in cost from $.08 for a frame building to $1 per cubic foot for a granite, "fireproof" structure. It may be said at the start that a man without wide and long experience and good judgment cannot use this method with any reliability whatever. The practice is to obtain the cost per cubic foot of a known building and to use this rate per foot to multiply the measured cubic contents of a proposed structure to determine its cost. The proposed building, should, of course, be similar to the known structure in sizes of rooms, in total contents and in the materials of which the building is constructed. If it is not exactly so, then good judgment must be used in making due allowance for the differences. In measuring the cubic contents of a building, the actual volume is usually taken from the outside of all walls and from the bottom of the foundations to the top of the roof, considering the slopes, towers, and dormers, chimneys, projecting courses and cornices as immaterial. In judging the rate per cubic foot a building should cost, careful consideration must be given to the sizes of the various rooms and enclosed spaces and the total size of the building, as well as the interior fittings, finish, the number of finished fronts and the kinds of materials of which they are constructed. Consideration must be given to the materials, such as brick, etc., and also to the construction of the interior partitions, frame or fireproof, and to the interior decorations, plaster, marble, tiling, etc. It is in this that the experienced judgment of the estimator is necessary,—in knowing the cost of completed buildings, in order to arrive at the cost of the structure and to make proper allowances, because very often a demand is made for such information in a very short time, and often before a line of the design or drawings has been made.

The accompanying table shows the cost of some fairly representative buildings constructed in Seattle and neighboring cities of the state of Washington, giving dates of completion and costs at those times, and the costs per cubic foot to conform to price costs of 1927, using for this conversion the changes as shown on page 128 of THE FORUM for January, 1928. These changes in prices taken from the chart assume 1913 and previous years as 100 per cent, and figures for subsequent years are: 1914, 98 per cent; 1915, 114; 1916, 156; 1917, 189; 1918, 190; 1919, 200; 1920, 268; 1921, 198; 1922, 171; 1923, 186; 1924, 194; 1925, 190; 1926, 187; and 1927, 185. The table printed herewith includes 69 buildings, 41 fireproof and 28 of cheaper construction, compiled from the best sources obtainable (generally the architects' figures). Using the costs as of 1927, this table gives 17 office buildings, varying in cost per cubic foot from 32 cents to 74.8 cents, average 52.6; two hotels, 40 and 60 cents; four apartments, 44 to 58.7 cents, average 51.2; four theaters 26.7 to 44.2 cents, average 36.9; nine loft buildings, 12.6 to 25.1, average 18.9; and five school buildings, 22.3 to 30.8, average 25.8 cents. This table of such varyings costs shows conclusively the necessity of having the completed and the proposed buildings approximately the same in size, in number of rooms and in construction. It also shows somewhat the effect in costs of much decoration and yet large inside spaces, as in theaters, compared to buildings having less decoration but many small spaces or rooms, as in office buildings or hotels. The buildings of cheaper construction shown in the table are simply given as statistics for varieties in uses and construction, varying in cost from 9 to 54 cents per cubic foot. These

may be used only when the proposed building is similar to one of these. It is to be noted, however, that even in this type of building, larger structures often cost less per cubic foot than smaller buildings.

The writer has a list of costs of many residences, but they vary so greatly in cost, plan, equipment and finish that they would be of no value as a guide in estimating. The accompanying table may be of some aid to architects and builders in cities other than Seattle, but as there is a wide difference in costs of materials and labor in various cities, a table of costs in each city would be of more value. It is to be hoped that tables will be prepared for other large cities.

The estimator in comparing the requirements of the proposed building to those of a structure of known cost should know the relative costs of materials and labor in the different cities and the dates of construction. He must know the class of building, its purpose; whether fireproof, mill or ordinary construction; the kinds of finish for interior and exterior walls, etc., and the class of people who are to occupy the proposed building. Manifestly, in connection with the last item, the kind of building required for a hotel or apartment for laborers, sailors, or lodgers, would not be as expensive as a first class hotel or apartment. The kind of apartment for well bred, well educated people, but of moderate means, would not be as elaborate and expensive as for the very wealthy. The variations in customs or in demands in different cities are sometimes very great; for instance, the demand for apartments in Seattle and many western cities is for two- or three-room suites,—seldom more than four or five rooms, with rents varying from $70 to $125 per month; while in New York, Chicago, Washington and some other eastern cities there may be considerable demand for apartments of from 10 to 15 rooms, renting for from $800 to $1500 per month. In such cases the rates given in the table for apartments would be of no value for comparison.

Of course, no thumb rule is as good as a detailed estimate, and the latter is not as conclusive as *bona fide* bids; but neither can be reliable until after working drawings and specifications have been made. An owner never wants to pay for all this architectural service as long as there is a doubt of proceeding with the building, and he always asks for an estimate before proceeding beyond the preliminary drawings stage. The estimates based on cubic foot costs are never accurate, except by a lucky coincidence, but they do serve a useful purpose in approximating the cost in the quickest way yet devised. An expert in actual costs can give a much more reliable estimate if he is provided with carefully drawn plans and an outline specification. Such an estimate can be made quickly by an experienced man.

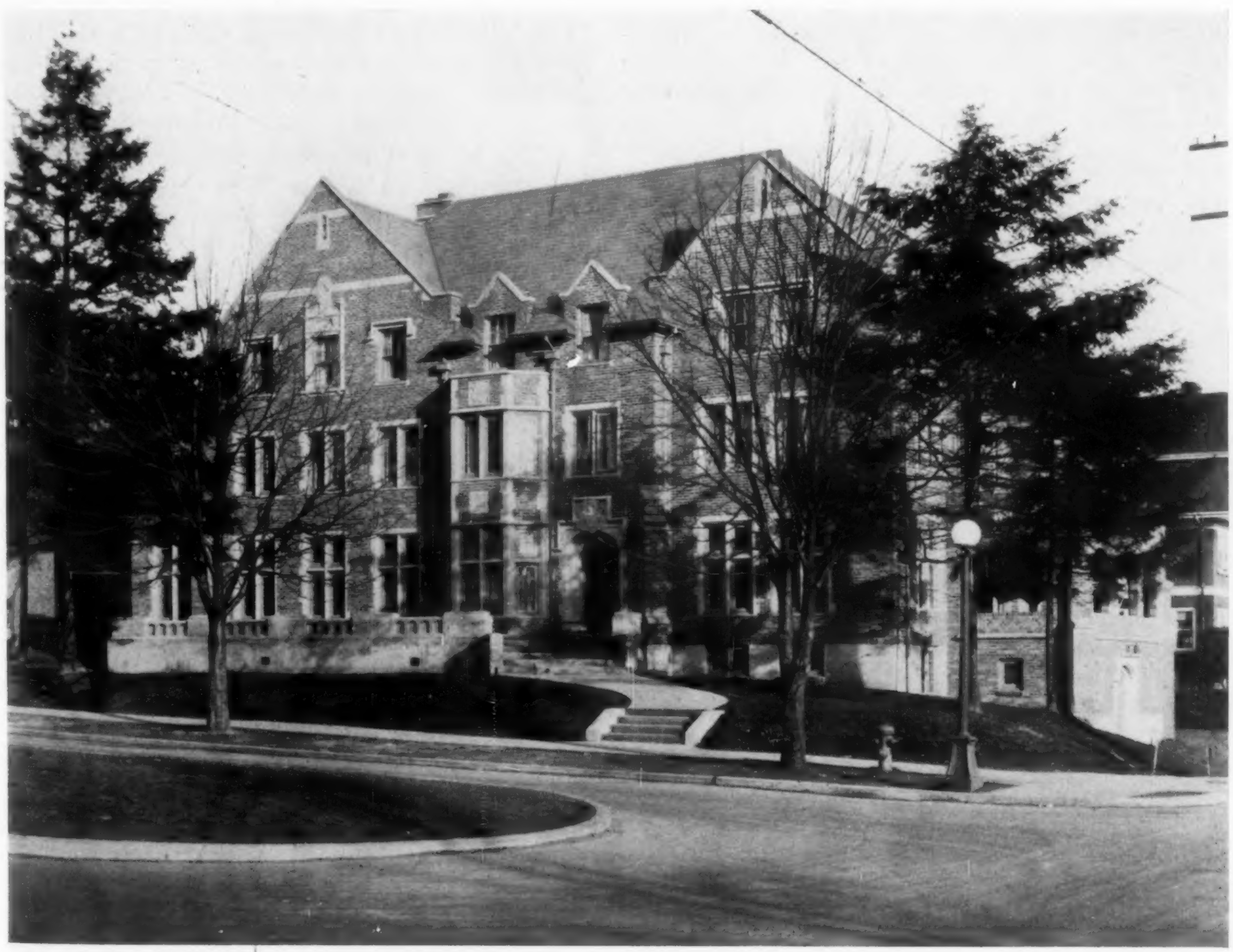
## COST OF BUILDINGS IN SEATTLE PER CUBIC FOOT

### FIREPROOF BUILDINGS

| *Name of Building* | *Year Built* | *Use or Occupancy* | *Construction Type* | *Number of Stories* | *Total Cubic Feet* | *Total Cost* | *Actual Cost Per Cu. Ft.* | *Cost Per Cu. Ft. As Of 1927* |
|---|---|---|---|---|---|---|---|---|
| Bigelow | 1923 | Office & Stores | R.C. | 7 | 60 x 120 | ...... | 45 cts. | 45 cts. |
| Lloyd | 1926 | " " | " | 10 | 819,910 | ...... | 52 | 52 |
| Shafer | 1924 | " " | " | 10 | 866,320 | $385,733 | 44 | 42.2 |
| Alaska | 1905 | " " | S.F. | 14 | 1,823,040 | 690,000 | 37.8 | 69.9 |
| White | 1911 | " " | R.C. | 14 | ...... | ...... | 36 | 66.6 |
| Henry | 1912 | " " | " | 14 | ...... | ...... | 34 | 62.9 |
| Cobb | 1914 | " " | " | 14 | ...... | ...... | 40 | 74.8 |
| Eagles Temple | 1924 | Aud. Office & Stores | " | 10 | 2,050,090 | 1,010,984 | 49.3 | 49.3 |
| Northern Life Tower | 1928 | Office | " | 27 | 2,710,926 | 1,500,000 | 55.3 | 55.3 |
| Puget Sound Power & Light | 1925 | Office | " | 2 | 201,000 | 66,529 | 33 | 33 |
| Mutual Life Annex | 1905 | " & Bank | S.F. | 6 | 297,000 | 106,804 | 36 | 66.6 |
| Dexter Horton | 1924 | " " | R.C. | 14 | 4,883,760 | 2,250,000 | 46.1 | 46.1 |
| Medical & Dental | 1924 | " " | " | 18 | 2,533,044 | 1,535,000 | 60 | 60 |
| Telephone | 1921 | " | " | 13 | 2,208,690 | 1,307,000 | 59.2 | 54.6 |
| Vance Hotel | 1926 | Hotel & Stores | " | 10 | 814,928 | ...... | 60 | 60 |
| Stratford Hotel | 1927 | " " | " | 9 | 580,860 | 235,060 | 40 | 40 |
| Terminal Sales | 1923 | Stores & Lofts | " | 11 | 1,309,900 | 329,971 | 25.1 | 25.1 |
| Hubbell Building | 1922 | " " | " | 2 | 498,688 | 106,256 | 21.3 | 23 |
| Hanford Building | 1921 | " " | " | 2 | 349,333 | 50,350 | 14.4 | 13.4 |
| Grunbaum Store | 1921 | " " | " | 4 | 1,850,350 | 337,177 | 18.2 | 17 |
| McDowall | 1926 | " " | " | 9 | 1,417,000 | 468,000 | 32 | 32 |
| Republic | 1927 | Loft | " | 10 | ...... | ...... | 41 | 41 |
| Liggett | 1926 | " | " | 10 | ...... | ...... | 42 | 42 |
| Century Addition | 1923 | " | " | 5 | ...... | ...... | 21 | 21 |
| Sherman-Clay W. H. | 1924 | " | " | 3 | 772,800 | ...... | 20.4 | 20.4 |
| Tyee Building | 1925 | Garage & Lofts | " | 2 | 682,240 | 147,486 | 21.6 | 21.6 |
| Kelly-Springfield | 1920 | " | " | 2 | 219,000 | 40,000 | 18.2 | 12.6 |
| Louisa Frye Building | 1926 | " | " | 3 | 358,441 | 57,278 | 16 | 16 |
| Mann Building | 1926 | Store-Theater-Lofts | " | 2 | 789,702 | 210,264 | 26.7 | 26.7 |
| Paramount Seattle Theater | 1927 | Theater | " | 8 | 2,833,920 | 1,250,000 | 44.2 | 44.2 |
| New Orpheum | 1927 | Theater, Moving Picture | " | 6 | 2,300,204 | 1,000,000 | 43.4 | 43.4 |
| Mayflower Theater | 1927 | " " " | " | 6 | 2,256,400 | 750,000 | 33.2 | 33.2 |
| Lawton Apartments | 1925 | Apartments | " | 7 | ...... | ...... | 57.5 | 57.5 |
| Windham Apartments | 1925 | " | " | 7 | 329,820 | 193,066 | 58.7 | 58.7 |
| Stockbridge Apartments | 1925 | " | " | 6 | 567,000 | 253,106 | 44.6 | 44.6 |
| Paramount Apartments | 1927 | " | " | 8 | 568,770 | 250,000 | 44 | 44 |
| St. Benedict's School | 1924 | Boys' School | " | 2 | 433,000 | 133,511 | 30.8 | 30.8 |
| Bryant School | 1926 | Grade " | R.C.-Fr.fl. | | 593,000 | 164,076 | 27.7 | 27.7 |
| Marshall School | 1926 | " " Junior | " " " | | 1,989,278 | 442,812 | 22.3 | 22.3 |
| Garfield School | 1922 | High " | " " " | | 2,430,000 | 619,394 | 24.5 | 27 |
| Roosevelt School | 1921 | " " | " " " | | 2,800,000 | 899,800 | 32.2 | 30 |

## NON-FIREPROOF BUILDINGS
## WOOD FLOOR CONSTRUCTION

| Name of Building | Year Built | Use or Occupancy | Construction Type | Number of Stories | Total Cubic Feet | Total Cost | Actual Cost Per Cu. Ft. | Cost Per Cu. Ft. As Of 1927. |
|---|---|---|---|---|---|---|---|---|
| School at Mt. Vernon | 1921 | High School | Brick | | 715,000 | $167,000 | 23.4 cts. | 22.2 cts. |
| School at Blaine | 1925 | " " | R. C. | | 210,000 | 36,500 | 17.5 | 17.5 |
| School at North Bend | 1921 | Grade " | Brick | | 266,000 | 55,158 | 20.7 | 19.3 |
| School at Ronald | 1913 | " " | " | 2 | 108,650 | 10,080 | 9.3 | 17.2 |
| L. & M. Stores | 1925 | Stores | Masonry & Wood | 1 | ...... | ...... | 14 | 14 |
| Gov. McGraw Stores | 1909 | " & Bus. School | " " | 3 | 343,440 | 27,616 | 8.1 | 15 |
| Backus Building | 1909 | " & Lofts | R. C. & Mill | 4 | 506,250 | 48,327 | 9.6 | 17.8 |
| Graves Building | 1908 | " " | " " " | 4 | 436,800 | 40,864 | 9.4 | 17.4 |
| Sears-Roebuck, Mail Order Bldg. | 1916 | " " | " " " | 6 | 2,732,460 | 202,000 | 7.4 | 9 |
| Willis-Overland Buldg. | 1925 | Garage " | " " " | 2 | 50′ high | ...... | 9.8 | 9.8 |
| Chanslor & Lyon Bldg. | 1919 | " " | " " " | 2 | 700,000 | 101,220 | 14.3 | 13.2 |
| Alvin Investment Co. | 1924 | " " | " " " | 3 | 462,000 | 49,268 | 11 | 10.5 |
| Colsky Stores | 1926 | Stores & Garage | Brick & " | 1 | 262,000 | 26,070 | 10.3 | 10.3 |
| Wenatchee Realty Co. | 1910 | " & Apts. | Masonry & Wood | 3 | 471,120 | 72,000 | 15 | 27.8 |
| Nesika Apts. | 1915 | 54 Apts. 2 & 3 Rooms | Brick & Mill | 5 | 333,360 | 64,756 | 19.4 | 31.4 |
| Lake Investment Co. | 1926 | " " " " | " " | 3 | 231,700 | 65,000 | 28 | 28 |
| L. & M. Apartment | 1924 | Apartments 34 | Masonry & Wood | 3 | ...... | ...... | 37 | 35.3 |
| L. & M. Apartment | 1921 | Apartments 30 | " " | 3 | ...... | ...... | 28 | 26.2 |
| Fairfax Apartment | 1923 | Apartments | " " | 3 | 152,779 | 51,634 | 33.8 | 33.8 |
| Carnegie Libr'y, Olympia | 1914 | Library | " " | 1 | 166,406 | 21,768 | 13.1 | 24.5 |
| Carnegie Libr'y, Wenatchee | 1912 | " | " " | 1 | 65,996 | 9,500 | 14.4 | 27.6 |
| Delta-Upsilon House | 1924 | Fraternity House | " " | 3 | 134,750 | 40,689 | 30 | 28.5 |
| Theta-Xi | 1926 | " " | " " | 3 | 112,640 | 38,463 | 34 | 34 |
| Alpha Sigma Phi | 1920 | " " | " " | 3 | 140,000 | 48,000 | 34.2 | 23.6 |
| Inglewood Club | 1926 | Country Club | " " | 2 | 447,900 | 133,017 | 30 | 30 |
| C. M. & St. P. Gateway | 1927 | R.R. Hotel & Sta. | " " | 2 | 455,303 | 247,772 | 54 | 54 |
| Armory N.G.W., Bellingham | 1911 | Drill Hall & Co. Rooms | Stone " | 3 | 851,640 | 64,880 | 7.6 | 14.1 |
| Gray's Harbor Power House | 1908 | Steam Power Machy. | Brick & Mill | 2 | 541,440 | 59,987 | 11.1 | 20.5 |



Sigma Alpha Epsilon House, University of Washington, Seattle
Stuart & Wheatley, Architects

# THE FAIREST OF COMPETITIONS

BY

WILLIAM O. LUDLOW

OF LUDLOW & PEABODY, ARCHITECTS

SO many times have I told my spellbound friends the inside story of that marvelous feat of legerdemain,—the taking of a two-million-dollar commission out of a hat,—that I don't mind telling it again.

It happened this way: Frank Manville, president of the Johns-Manville Corporation, decided that his company must have a larger building to take care of its larger business. So far easy enough; they had the land, the money, the will to do; but immediately Mr. Manville was faced with a staggering question,—how could he select one architect, from all the architects who had been giving him business, without offending the individuals of the entire profession,—save one,—and without thus jeopardizing the future of the Johns-Manville business? If, for instance, he handed the commission outright to Cass Gilbert, imagine the look of scorn on the face of Whitney Warren's specification man when next the Johns-Manville salesman suggested asbestile for the latest Park Avenue skyscraper! Again, if he held a competition, he knew he would be set down as a man of execrable taste and bad judgment by the personnel of the entire profession,—save one,—when the winning design was exhibited! While pondering this difficulty one day, one of his men (said to have been originally on the stock exchange) suggested to Mr. Manville: "Why not let them *draw* for it?" Mr. Manville, naturally a quiet and cautious man, at first laughed at the joke for, knowing the haughty dignity and the high ethical standards of the members of the profession, he didn't propose to insult his good friends and customers.

The foregoing is from reputable hearsay;—from now on I speak from personal knowledge. One day a well known officer of the Johns-Manville Corporation appeared in our office and asked if it would be beneath our dignity or contrary to our ethical standards to take a chance on drawing from a hat an opportunity to design the new Johns-Manville building. Of course we said that it certainly would,—but possibly we might consider the matter,—just this once. We understood that some of the members of the profession thus approached did not take the same high ground that we did, but trampling on all principle, simply answered: "We would be glad to." A few days later we received a personal invitation for a "representative of our firm" to a luncheon given by Mr. Manville at the Union League Club. As there happen to be two representatives of our firm, we decided that the firm would not be adequately represented unless both went,—not harboring for a moment the thought that some firm might have only one representative when the hat passed!

Twenty of us sat down to a big round table overburdened with delicious food. Finally, we recognized a cool, yellow, sparkling liquid served in beer mugs, and then the stillness was broken by Mr. Manville, as he arose with a derby hat in one hand and a bunch of little white envelopes in the other. In a few well chosen words he told his guests of his proposed project and said that he had confidence that any one of the gentlemen present would design for him a suitable building, adding that he would be glad to give it to all of us, but as that method might be unsatisfactory, would we kindly each one draw from the hat an envelope? In each envelope, he said, was a blank card excepting one in which would be found a card saying "You Win," and he would like the man who drew that card to be his architect. As the fateful hat went around each man dipped in. I hasten to interject here, to avoid being suspected of double dealing (perhaps that is in the wrong metaphor), that my partner was so scrupulously generous and honest, that he passed his opportunity over to his partner; was ever virtue so instantly rewarded? I am going to ask Briggs to draw a cartoon entitled "What does a man think about when he holds in his hand an envelope containing either a two-million-dollar commission,—or nothing?" Something like this went through my benumbed mind:—In this little envelope a skyscraper or a blank piece of paper! One chance in twenty! Pshaw, that's what I take every time I jay-walk across Fifth Avenue, and I've never been hit yet! I wonder whether Tom Hastings, or Breck Trowbridge, or Whitney Warren will get it!

"Now," said Mr. Manville, "begin here and open up,—each one announcing in turn what he has drawn." With painful slowness the words began to come to my somewhat clouded mind,—"Nothing doing," "Blank," "Blank," "Left again." Then the brilliant deduction began to dawn in my mind that if all the others got *blank*, I got *it!* The suspense was terrible, so with my table knife I slit my envelope and cautiously pulled a little at the card inside,—cat and mouse performance. Hello, what's this! A tiny wreath appears;—yes, I suppose they all have wreaths on them like other tombstones. Great —— "You Win!" I took the blow just like Tunney,—manfully,—everything went around inside my head, but at the count of ten I recovered, found everybody still there, and sat trying to look like a sphinx but feeling like an opium addict. Then John Cross, who had peeped at my card, spilled the beans by shouting "Here he is!" I faintly heard yells of "Speech! speech!"

Twenty handshakes from as many slightly disappointed but complacent men;—then, "Glad you fellows are going to be my architects, I want to begin right away, see you tomorrow,"—and so ended the fairest and most satisfactory competition on record.

# PLANNING RELIGIOUS EDUCATIONAL BUILDINGS

BY

M. W. BRABHAM

THE phenomenal increase of interest and investment in religious education during the past ten years has been followed by a like increase in attention to the standard requirements for buildings suited to the purposes. Leaders in religious education are today considering their work in a manner approaching if not equaling the seriousness of leaders in general education processes. This has resulted in the study and gradual development of a new type of building which is a far cry from the "Sunday School room" or "annex" of a few years ago. The introduction of a definite program of training involving theories and practices in educational processes of a religious nature extending far beyond the customary one-hour Sunday School, calls for structures as carefully planned and equipped as the best educational buildings for public schools. The numerical growth has also been astonishingly large, until today it is not an unusual thing to find structures accommodating from 1000 to 5000 persons.

The Sunday School is coming to be known generally nowadays as the "Church School," the very name implying a change of emphasis and a broadening of program. The school for religious work is graded in all its educational processes, and this is calling for buildings also graded in arrangements. Within the organization there are eight age groups commonly recognized, these being based on well founded psychological principles. Within each of these eight age groups there are subdivisions by grades and classes. The program for each age group varies in essential points, all of which calls for different arrangements as to sizes, shapes and general appointments of rooms. This can be readily seen as a highly specialized field, demanding preparation and experience not commonly regarded as a part of the general architectural preparation of those practicing in this field. To date the number of architectural organizations employing specialists in the field of religious administration and theory is very small, but the probabilities are that these workers will be engaged for handling such aspects of the work in increasing numbers. There are several available books on the subject which may be found helpful to architects in connection with this special line of service: "Building for Church Work and Life," by Mouzon William Brabham (Cokesbury Press, Nashville, 1928); "Building for Religious Education," by Henry Edward Tralle and George Merrill (The Century Company, New York, 1925); "A Complete Guide to Church Building," by P. E. Burroughs (Baptist Sunday School Board, Nashville).

The schedules printed here have been worked out as a general guide for architects and committees to be used in determining some important features of religious educational buildings.

TABLE I

Church School Having 900 Members

| Group | Ages | Per Cent | No. of Pupils | Sq. Ft. | Assembly Rooms | Classrooms | Members Per Class |
|---|---|---|---|---|---|---|---|
| Cradle roll | 1-2-3 | 5 | 45 | 675 | 2 | 0 | |
| Beginner | 4-5 | 8 | 72 | 1080 | 1-2 | 0 | ... |
| Primary | 6-7-8 | 10 | 90 | 1350 | 1 | 9 | 8-10 |
| Junior | 9-10-11 | 10 | 90 | 1350 | 1 | 9 | 8-12 |
| Intermediate | 12-13-14 | 10 | 90 | 1350 | 1 | 7-10 | 8-15 |
| Senior | 15-16-17 | 10 | 90 | 1350 | 1 | 7-10 | 8-20 |
| Young people | 18-23 | 20 | 180 | 2700 | 1 | 6-8 | 15-40 |
| Adult | 24 upward | 27 | 243 | 3645 | 1 | 6-9 | 15-150 |
| Total | | | 900 | 13,500 | 9 | 44-55 | |

Adults may use main auditorium of church for assembly if necessary.

*Note.* Classrooms not opening into the assembly room are to be preferred where shape of lot and size of building lend themselves to this arrangement.

*Other Rooms.* Social hall, which may also be the assembly room for one of the departments of pupils above 12 years old; kitchen and serving rooms; mothers' room or rooms, in close proximity to the cradle roll; women's parlor or parlors; boy scout and camp fire girl rooms, both of which may be figured in floor space for either intermediate or senior classes; chapel adapted to prayer meetings and other gatherings, which may be used as an assembly for one group, such as intermediate or senior. Rooms adapted to meetings of young people; these may also be used for an assembly or for large classes; pastor's office and study; room for pastor's assistant or assistants; church offices; Sunday School officers' room; library and reading room; coat room facilities; toilets; cabinets in each assembly room and in library ; storage and janitor's room; gymnasium, where local conditions require it and where adequate supervision will be maintained. Minimum size classroom: 8 x 10 feet. Blackboards should be provided in classrooms and in assembly rooms.

TABLE II

Church School Having 1200 Members

| Group | Ages | Per Cent | No. of Pupils | Sq. Ft. | Assembly Rooms | Classrooms | Members per Class |
|---|---|---|---|---|---|---|---|
| Cradle roll | 1-2-3 | 5 | 60 | 900 | 2 | 0 | |
| Beginner | 4-5 | 8 | 98 | 1,440 | 2 | 0 | ... |
| Primary | 6-7-8 | 10 | 120 | 1,800 | 1 | 12-14 | 8-10 |
| Junior | 9-10-11 | 10 | 120 | 1,800 | 1 | 10-12 | 10-12 |
| Intermediate | 12-13-14 | 10 | 120 | 1,800 | 1 | 10-12 | 10-15 |
| Senior | 15-16-17 | 10 | 120 | 1,800 | 1 | 9-12 | 10-20 |
| Young people | 18-23 | 20 | 240 | 3,600 | 1 | 7-12 | 15-40 |
| Adult | 24 upward | 27 | 324 | 4,860 | 1 | 6-10 | 15-150 |
| Total | | | 1,200 | 18,000 | 10 | 54-72 | |

*Note.* Classrooms for primary and junior groups should be apart from the assembly room when size and shape of lot permit separate arrangement. The number of classrooms for each of these groups may be reduced by providing for one-half to be in classes while the other half is in assembly.

*Other Rooms.* Social hall, which may also be used as an assembly room for one of the departments,—this room should accommodate from 800 to 1000; kitchen and serving room; kitchenette convenient to room or rooms used for smaller social gatherings or young people's department; mothers' rooms (2) convenient to cradle roll rooms. These may be counted in as a part of the total floor space for adult classes; women's parlors (2), which may also be used as adult classrooms, or one may be arranged for young people; boy scout and camp fire girl rooms, which may also be counted in total classroom space for either the intermediate or senior classes; pastor's study; pastor's office and conference room; church offices; assistant pastor and director of religious education (2 rooms); Sunday School officers' room or rooms; library and supply room; reading room, which may also be training classroom and figured in total classroom space for young people; coat room facilities; toilets; storage and janitor's room or rooms; gymnasium. Minimum size of classrooms: 8 x 10 feet. Blackboards in classrooms.

TABLE III
Church School Having 1600 Members

| Group | Ages | Per Cent | No. of Pupils | Sq. Ft. | Assembly Rooms | Classrooms | Members per Class |
|---|---|---|---|---|---|---|---|
| Cradle roll | 1-2-3 | 5 | 80 | 1,200 | 2 | 0 | ... |
| Beginner | 4-5 | 8 | 128 | 1,920 | 2 | 0 | ... |
| Primary | 6-7-8 | 10 | 160 | 2,400 | 1 | 16-20 | 8-10 |
| Junior | 9-10-11 | 10 | 160 | 2,400 | 1 | 16-24 | 8-12 |
| Intermed. | 12-13-14 | 10 | 160 | 2,400 | 1 | 12-20 | 8-15 |
| Senior | 15-16-17 | 10 | 160 | 2,400 | 1 | 10-18 | 10-20 |
| Young people | 18-23 | 20 | 320 | 4,800 | 1 | 10-14 | 15-50 |
| Adult | 24 upward | 27 | 432 | 6,480 | 1 | 8-10 | 15-200 |
| Total | | | 1,600 | 24,000 | 10 | 72-106 | |

*Note.* Junior and primary classrooms should not open into assembly room unless the size and shape of lot make other arrangements impossible. The number of classrooms for each of these departments may be reduced by planning for one-half of the department to be in class session while the other half is in assembly. This is an administrative matter for the local school.

*Other Rooms.* Social hall, which may also be the adult or young people's assembly room,—this room should care for at least 1,000 to 2,000; kitchen and serving rooms; kitchenette for smaller gatherings; mothers' rooms (2) near cradle roll rooms may be counted as adult classes; women's parlors (2 or more); church parlor and steward's rooms, boy scout and camp fire girl rooms; also counted as intermediate or senior classrooms; pastor's study; pastor's office and conference room; assistant pastor's room; room for director of religious education; church offices and vault; storage and janitor's rooms; library; reading room; Sunday School officers' rooms; coat rooms; toilets; gymnasium and locker rooms; chapel for prayer meetings, which may also be assembly room; rooms adapted to young people's meetings; men's club room; girls' club room; boys' club room; nursery.

TABLE IV
Church School Having 2,000 Members

| Group | Ages | Per Cent | No. of Pupils | Sq. Ft. | Assembly Rooms | Classrooms | Members per Class |
|---|---|---|---|---|---|---|---|
| Cradle roll | 1-2-3 | 5 | 100 | 1,500 | 3 | 0 | ... |
| Beginner | 4-5 | 8 | 160 | 2,400 | 3 | 0 | ... |
| Primary | 6-7-8 | 10 | 200 | 3,000 | 2 | 20-22 | 8-10 |
| Junior | 9-10-11 | 10 | 200 | 3,000 | 2 | 18-20 | 8-12 |
| Intermed. | 12-13-14 | 10 | 200 | 3,000 | 1 | 18-20 | 8-16 |
| Senior | 15-16-17 | 10 | 200 | 3,000 | 1 | 18-20 | 10-20 |
| Young people | 18-23 | 20 | 400 | 6,000 | 1 | 12-16 | 15-50 |
| Adult | 24 upward | 27 | 540 | 8,100 | 1 | 10-15 | 15-200 |
| Total | | | 2,000 | 30,000 | 14 | 96-113 | |

*Note.* Junior and primary rooms may be reduced in number by planning for one-half of the department to be in class work while the other half is in assembly, but this is an administrative matter to be worked out locally. Classrooms for these two departments should be separate from the assembly rooms, preferably not opening into the assembly room at all.

*Other Rooms.* Social hall, accommodating from 1,200 to 1,400, to be used as adult or young people's assembly; kitchen and serving room nearby; kitchenettes within easy reach of smaller rooms for social purposes; mothers' rooms (3) near cradle roll rooms; these may be counted in as part of space for adult classes; parlors (3 to 5) may be used as classrooms if necessary; boy scout rooms (2); camp fire girl rooms (2),—they may be used as classrooms for intermediate or senior classes; club rooms,—young women (1); boys' (1); girls' (1); women (1); men (1); young men (1). Some of these, if located conveniently, may also be used for classes. There shall be administrative rooms: pastor's study (1); pastor's office and conference room (1); assistant pastor (1); director of religious education (1); church offices (2 to 4); vault (1); janitor's rooms (2); library (1); reading room (1); Sunday School officers' rooms (2); chapels (2 to 4). These may be used as prayer meeting rooms and as assembly rooms in some cases. There should be a gymnasium with locker and shower rooms for each sex; blackboards in all class and assembly rooms; cabinets in all department rooms built in to side or rear; coat rooms; toilets; drinking fountains; nurseries and rest rooms.